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1900 Aurivillius, Professor Christopher, *Stockholm.*

1915 Berlese, Professor Antonio, *via Romana*, 19, *Firenze, Italy.*

1905 . Bolivar, Ignacio, *Museo nacional de Historia natural, Hipodromo*, 17, *Madrid.*

1911 Comstock, Prof. J. H., *Cornell University, Ithaca, New York, U.S.A.*

1894 Forel, Professor Auguste, M.D., *Yvorne, Canton de Vaud, Switzerland.*

1898 Grassí, Professor Battista, *The University, Rome.*

1915 ‡ Howard, Dr. L. O., *Chief Bureau of Entomology, U.S. Dept. of Agriculture, Washington, U.S.A.*

1914 Lameere, Professor A., 74, *rue Defacq, Bruxelles.*

1918 Marchal, Dr. Paul, President of the Entomological Society of France, 45, *rue de Verrières, Antony, Seine, France.*

1908 Oberthür, Charles, *Rennes, Ille-et-Vilaine, France.*

1913 Tian-Shanski, A. P. Semenoff, *Vassili Ostrov*, 8 *lin.*, 39, *Petrograd, Russia.*

1911 Wasmann, Fr. Erich, S.J., *Valkenburg (L.) Ignatius Kolleg, Holland.*

SPECIAL LIFE FELLOWS.

Date of Election.

1916 (1894) Miall, Louis Compton, F.R.S., (Council, 1903, 1908), *Norton Way N., Letchworth.*

1916 (1888) Yerbury, Colonel John W., late R.A., F.Z.S., (Council, 1896, 1903-5), 2, *Ryder-street, St. James's*, S.W. 1.

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(*The names of those who have not yet paid either the Entrance Fee or the first year's subscription are not included.*)

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1913 ‡ Adams, B. G., 15, *Fernshaw-road, Chelsea*, S.W.

1877 * Adams, Frederick Charlestrom, F.Z.S., 2B, *Montague-mansions, Portman-square*, W. 1.
1919 Aders, Dr. W. M., *Zanzibar, E. Africa.*
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1885 ‡ Adkin, Robert, (Council, 1901–2, 1911–13), *Hodeslea, Meads, Eastbourne.*
1912 Allen, J. W., M.A., 266, *Wiliesden-lane, London*, N.W. 2.
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1899 ‡ Andrews, Henry W., *Woodside, Victoria-road, Eltham*, S.E. 9.
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1908 † Antram, Charles B., *Somerdale Estate, Ootacamund, Nilgiri Hills, S. India.*
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1907 ‡ Arnold, G., D.Sc., A.R.C.S., *Rhodesia Museum, Bulawayo, South Africa.*
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1907†‡Ashby, Sidney R., 8, *Elm Tree-road, St. John's Wood*, N.W. 8.
1886 Atmore, E. A., 48, *High-street, King's Lynn.*
1913 Avinoff, André, *Liteyny*, 12, *Petrograd, Russia.*
1914 Awati, P. R., Medical Entomologist, c/o Grindlay & Co., Bankers, 26, *Westmorland-street, Calcutta.*

1901 ‡ Bacot, Arthur W., (Council, 1916–18), *York Cottage, York-hill, Loughton, Essex.*
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1909 ‡ Bagwell-Purefoy, Capt. Edward, *East Furleigh, Maidstone.*
1916 ‡ Balfour, Miss Alice, 4, *Carlton-gardens*, S.W., and *Whittingehame, Prestonkirk, Scotland.*
1912 Ballard, Edward, Govt. Entomologist, *Agricultural College and Research Institute, Coimbatore, Madras, S. India.*
1886 ‡ Bankes, Eustace R., M.A.
1890 Barclay, Francis H., F.G.S., *The Warren, Cromer.*
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1895 Barker, Cecil N., 81, *Bellevue-road, Durban, Natal, South Africa.*
1920 ‡ Barns, Thomas Alexander, F.Z.S., 32, *Windsor-court, Bayswater*, W. 2.
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1907 ‡ Bartlett, H. Frederick D., 1, *Myrtle-road, Bournemouth.*
1894†‡Bateson, Prof. William, M.A., F.R.S., Fellow of St. John's College, Cambridge, *The Manor House, Merton, Surrey.*
1908 Bayford, E. G., 2, *Rockingham-street, Barnsley.*
1904 Bayne, Arthur F., c/o Messrs. Freeman, *Castle-street, Framlingham, Suffolk.*
1912 ‡ Baynes, Edward Stuart Augustus, 120, *Warwick-street, Eccleston-square*, S.W. 1.
1896†‡Beare, Prof. T. Hudson, B.Sc., F.R.S.E., (V.-Pres., 1910; Council, 1909–11), 10, *Regent Terrace, Edinburgh.*
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1914 † Butterfield, Rosse, Curator, *Corporation Museum, Keighley, Yorks.*

1912†‡Buxton, Patrick Alfred, M.B.O.U., 31, *Grange-road, Cambridge.*

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1917 Cameron, Dr. Alfred E., M.A., D.Sc., *University of Saskatchewan, Saskatown, Canada.*

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1880 Cansdale, W. D., *Sunny Bank, South Norwood*, S.E. 25.

1889 ‡ Cant, A., 33, *Festing-road, Putney*, S.W. 15.

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1898 ‖ Carpenter, J. H., *Redcot, Belmont-road, Leatherhead.*

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1912 Carter, Henry Francis, Assistant Lecturer and Demonstrator in Medical and Economic Entomology, *Liverpool School of Tropical Medicine, University of Liverpool.*

1906 ‡ Carter, H. J., B.A., *Garrawillah, Kintore-street, Wahroonga, Sydney, N.S.W.*

1889†‡Cave, Charles J. P., *Ditcham Park, Petersfield.*

1920 ‡ le Cerf, F., Curator of the Lepidoptera in the Paris Museum, 13, *rue Guy de la Brosse, Paris.*

1900 Chamberlain, Neville, *Westbourne, Edgbaston, Birmingham.*

1871 ‡ Champion, George C., F.Z.S., A.L.S., Librarian, 1891– (Council, 1875–7); *Heatherside, Horsell, Woking;* and 45, *Pont-street*, S.W. 1.

1914 ‡ Champion, Harry George, B.A., Assistant Conservator of Forests, *W. Almora, U.P., India.*

1891 ‡ Chapman, Thomas Algernon, M.D., F.R.S., F.Z.S., (V.-Pres., 1900, 1904–5, 1908, 1916–17; Council, 1898–1900, 1903–5, 1907–9, 1916–18), *Betula, Reigate.*

1919 Chatterjee, Nibavan Chandra, B.Sc., *Forest Research Institute, Dehra Dun, U.P., India.*

1897 ‡ Chawner, Miss Ethel F., *Forest Bank, Lyndhurst S.O., Hants.*

1913 ‡ Cheavin, Capt. W. H. S., F.C.S., F.R.M.S., F.N.P.S., Demonstrator, Chemistry Dept., Middlesex Medical College, *Middlesex Hospital Medical School*, W. 1.

1919 Cheesman, Miss L. Evelyn, *Entomological Dept., Zoological Society, Regent's Park*, N.W. 8.

1920 Cheetham, Christopher Arthington, *Wheatfield, Old Farnley, Leeds.*

1889 Christy, William M., M.A., F.L.S., *Watergate, Emsworth.*

1914 Chrystal, R. Neil, B.Sc., 277, *First-avenue, Ottawa, Canada.*

1909 Clark, Lt.-Col. C. Turner, F.Z.S., *Hillcrest, St. Augustine's-avenue, S. Croydon.*

1908 || Clark, Edgar L., 34, *Smith-street, Durban, Natal.*

1914 Cleare, L. D., Dept. of Science and Agriculture, *Georgetown, British Guiana.*

1914 Cleghorn, Miss Maude Lina West, F.L.S., 12, *Alipore-road, Calcutta, India.*

1908 Clutterbuck, Charles G., *Heathside*, 23, *Heathville-road, Gloucester.*

1908 Clutterbuck, P. H., *Indian Forest Department, Naini Tal, United Provinces, India.*

1904 ‡ Cockayne, Edward A., M.A., M.D., F.R.C.P., (Council, 1915–17), 65, *Westbourne-terrace*, W. 2.

1917 ‡ Cockerell, Prof. T. D. A., *University of Colorado, Boulder, Colorado, U.S.A.*

1917 ‡ Cocks, Frederick, 26, *Crown-street, Reading.*

1914 Coleman, Leslie C., Dept. of Agriculture, *Bangalore, Mysore, India.*

1899 ‡ Collin, James E., F.Z.S., (V.-Pres., 1913; Council, 1904–6, 1913–15), *Sussex Lodge, Newmarket.*

1906 || Collinge, Walter E., D.Sc., M.Sc., F.L.S., *The Gatty Marine Laboratory, St. Andrews, Scotland.*

1918 Comstock, Dr. John Adams, *c/o* the South-Western Museum, *Marmion-way and Avenue, Los Angeles, California, U.S.A.*

1913 ‡ Coney, Miss Blanche A., *The Poplars, Pucklechurch, Gloucestershire.*

1919 ‡ Constable, Miss Florence B., 17, *Colville Mansions*, W. 11.

1919 * Corbett, H. H., 3, *Thorne-road, Doncaster.*

1916 Cornford, The Rev. Bruce, 13, *Havelock-road, Portsmouth.*

1920 ‡ Cotterell, G. S., *Newlyn, Gerrard's Cross, Bucks.*

1911 ‖ Cotton, Sidney Howard, 1A, *Chesterfield-street, Mayfair*, W. 1.
1913 Coward, Thomas Alfred, F.Z.S., 36, *George-street, Manchester.*
1920 Crabbe, 52, *Sarsfeld-road, Balham*, S.W. 12.
1895 Crabtree, Benjamin Hill, *Holly Bank, Alderley Edge, Cheshire.*
1913 Cragg, Major F. W., M.D., I.M.S., *Central Research Institute, Kasauli, Punjaub, India.*
1919 Crampton, Prof. E. Chester, *Massachusetts Agricultural College, Amherst, Mass., U.S.A.*
1909 ‡ Crawley, W. C., B.A., (Council, 1917–19), 29, *Holland Park-road*, W. 14.
1890 Crewe, Sir Vauncey Harpur, Bart., *Calke Abbey, Derbyshire.*
1907 ‡ Croft, Edward Octavius, M.D., 12, *North Hill-road, Headingley, Leeds.*
1908 ‖ Culpin, Millais, M.B., F.R.C.S., *Stydersgate, Loughton, Essex.*
1919 ‡ Cumming, Bernard Douglas, *Boulderwall, East Hill-road, Oxted.*
1908 Curtis, W. Parkinson, *Drake North, Sandringham-road, Parkstone, Dorset.*

1900 Dalglish, Andrew Adie, 7, *Keir-street, Pollokshields, Glasgow.*
1886 ‡ Dannatt, Walter, *St. Lawrence, Guibal-road, Lee*, S.E.
1911 Davey, H. W., Inspector of Department of Agriculture, *Melbourne, Victoria, Australia.*
1912 Davidson, James, M.Sc., *Institute of Plant Pathology, Rothamsted, Harpenden, Herts.*
1905 Davidson, James D., 32, *Drumsheugh Gardens, Edinburgh.*
1912 Davis, Frederick Lionel, J.P., M.R.C.S., L.R.C.P., *Belize, British Honduras.*
1910 ‡ Dawson, William George, 12, *Bromley Grove, Shrublands, Kent.*
1903 Day, F. H., 26, *Currock-terrace, Carlisle.*
1898 Day, G. O., *Sahlatston, Duncan's Station, Vancouver Island, British Columbia.*
1917 ‡ Dicksee, Arthur, 24, *Lyford-rd., Wandsworth Common*, S.W. 18.
1875 ‡‖ Distant, William Lucas, (V.-Pres., 1881, 1900; Sec., 1878–80; Council, 1900–2), *Glenside*, 170, *Birchanger-road, South Norwood*, S.E. 25.
1887 ‡ Dixey, Frederick Augustus, M.A., M.D., F.R.S., Fellow and Bursar of Wadham College, (Pres., 1909–10; V.-Pres., 1904–5, 1911; Council, 1895, 1904–6), *Wadham College, Oxford.*
1909 † Dobson, Thomas, 33, *The Park, Sharples, Bolton.*
1905 Dodd, Frederick P., *Kuranda, viâ Cairns, Queensland.*
1912 ‡ Doig, Major Kenneth Alan Crawford, R.A.M.C., M.R.C.S., L.R.C.P., 3, *Hook Heath, Woking.*
1906 * Doncaster, Leonard, M.A., *The University Museum of Zoology, Cambridge.*
1891 ‡ Donisthorpe, Horace St. John K., F.Z.S., (V.-Pres., 1911; Council, 1899–1901, 1910–12), *Durandesthorpe*, 19, *Hazlewell-road, Putney*, S.W. 15.

1920 Douglas-Crompton, Sydney, *Villa Helvetia, Cortebelle, Hyères, France.*

1913 ‡ Dow, Walter James, 5, *Great College-street, Westminster*, S.W. 1.

1910 Downes-Shaw, Rev. Archibald, *Scotton Rectory, Gainsborough.*

1884 ‡ Druce, Hamilton H. C. J., F.Z.S., (Council, 1903–5), 26, *South Hill Park, Hampstead*, N.W. 3.

1900 Drury, W. D., *Clarendon, Laton-road, Hastings.*

1894 Dudgeon, G. C., 1, *Zetland House, Cheniston-gardens, Kensington*, W. 8.

1913 Duffield, Charles Alban William, *Stowting Rectory, Hythe*, and *Wye College, Kent.*

1906 ‡ Dukinfield Jones, E., 118, *Fairview-avenue, Glendale, California, U.S.A.*

1883 ‡ Durrant, John Hartley, (V.-Pres., 1912–13; Council, 1911–13, 1919–), *Merton*, 17, *Burstock-road, Putney*, S.W. 15; and *British Museum (Natural History), Cromwell-road, S. Kensington*, S.W. 7.

1910 ‡ Eales-White, Capt. J. Cushny, 49, *Chester-terrace, Eaton-square*, S.W. 1.

1912 ‡ Earl, Herbert L., M.A., *Vanessa, Rawlyn-road, Torquay.*

1865 ‡ Eaton, The Rev. Alfred Edwin, M.A., (Council, 1877–9), *Richmond Villa, Northam S.O., N. Devon.*

1902 ‡ Edelsten, Hubert M., *The Elms, Forty Hill, Enfield, Middlesex.*

1919 Edwardes, Capt. Tickner, R.A.M.C., *The Red Cottage, Burpham, Arundel, Sussex.*

1911 ‡ Edwards, F. W., 56, *Norton-road, Letchworth.*

1886 Edwards, James, *Colesborne, Cheltenham.*

1884 ‡ Edwards, Stanley, F.L.S., F.Z.S., (Council, 1912–14), 15, *St. Germans-place, Blackheath*, S.E. 3.

1913 Edwards, William H., *Natural History Dept., The Museum, Birmingham.*

1916 ‡ Effalatoun, Hassan, *Shoubrah-avenue, Cairo, Egypt.*

1900 ‡ Elliott, E. A., 41, *Chapel Park-road, St. Leonards-on-Sea.*

1900 ‡ Ellis, H. Willoughby, F.Z.S., (Council, 1916–18), 3, *Lancaster-place, Belsize Park*, N.W. 3.

1919 Elston, Albert H., *Delemont, Childers-street, N. Adelaide, Australia.*

1903 ‡ Eltringham, Harry, M.A., D.Sc., F.Z.S., (V.-Pres., 1914, 1918; Council, 1913–15, 1918–), *Woodhouse, Strond, Gloucestershire*, and *Hope Department, University Museum, Oxford.*

1878 Elwes, Henry John, J.P., F.R.S., F.L.S., F.Z.S., (Pres., 1893–4; V.-Pres., 1889–90, 1892, 1895; Council, 1888–90), *Colesborne, Cheltenham.*

1903 Etheridge, Robert, *Curator, Australian Museum, Sydney, N.S.W.*

1908 Eustace, Eustace Mallabone, M.A., *Wellington College, Berks.*

1919 Evans, Lt.-Col. Wm. Henry, D.S.O., R.E., c/o Messrs. Cox & Co., 16, *Charing Cross*, W.C. 2.

1919 Falconer, William, *Wilberlee, Plaithwaite, Huddersfield*

1907 Feather, Walter, *Cross Hills, nr. Keighley, Yorks.*

1900 ‡ Feltham, H. L. L., *Mercantile Buildings, Simmonds-street, Johannesburg, Transvaal.*

1861 ‡ Fenn, Charles, *Eversden House, Burnt Ash Hill, Lee*, S.E. 12.

1920 Fenton, Edward Wyllie, M.A., B.Sc., *Seale-Hayne Agricultural College, Newton Abbot, Devon.*

1910 Fenyes, A., M.D., 170, *North Grange Grove-Arenue, Pasadena, California, U.S.A.*

1918 Ferguson, Anderson, 22, *Polwarth-gardens, Glasgow, W.*

1889 Fernald, Prof. C. H., c/o H. T. Fernald, Esq., *Amherst, Mass., U.S.A.*

1900 Firth, J. Digby, F.L.S., *Boys' Modern School, Leeds.*

1898 ‡ Fletcher, Prof. T. Bainbrigge, R.N., *Agricultural Research Institute, Pusa, Bihar, India.*

1883 † Fletcher, William Holland B., M.A., *Aldwick Manor, Bognor.*

1905 Floersheim, Cecil, 16, *Kensington Court Mansions*, S.W. 8.

1885 Fokker, A. J. F., *Zierikzee, Zeeland, Netherlands.*

1914 Fordham, William John, M.R.C.S., L.R.C.P., *City Hospital, Winter-street, Sheffield.*

1913 Foster, Arthur H., M.R.C.S., L.R.C.P.(Eng.), M.B.O.U., *Sussex House, Hitchin, Herts.*

1900 Foulkes, P. Hedworth, B.Sc., *Harper-Adams Agricultural College, Newport, Salop.*

1898 ‡ Fountaine, Miss Margaret, 256, *Second-street, San José, California, U.S.A.*

1880 ‡ Fowler, The Rev. Canon, D.Sc., M.A., F.L.S., (Pres., 1901–2; V.-Pres., 1903; Sec., 1886–96), *Earley Vicarage, near Reading.*

1920 ‡ Fox-Wilson, J., *S. Entomological Dept., R.H.S. Laboratory, Wisley, Ripley, Surrey.*

1908 Fraser, Frederick C., Capt., M.D., I.M.S., 309, *Brownhill-road, Catford, S.E.*

1896 Freke, Percy Evans, *Southpoint, Limes-road, Folkestone.*

1888 ‡ Fremlin, H. Stuart, M.R.C.S., L.R.C.P., *Markwith, Nether-street, North Finchley.*

1910 ‡ Frisby, G. E., 31, *Darnley-road, Gravesend.*

1908 Froggatt, Walter W., F.L.S., Government Entomologist, *Agricultural Museum, George-street North, Sydney, New South Wales.*

1891 Frohawk, F. W., *Uplands, Thundersby, Essex.*

1900 ‡ Fryer, H. Fortescue, *The Priory, Chatteris, Cambs.*

1907 ‡ Fryer, John Claud Fortescue, M.A., (Council, 1916–18), *Milton-road, Harpenden, Herts.*

1876 ‡ Fuller, The Rev. Alfred, M.A., *The Lodge, 7, Sydenham-hill, Sydenham*, S.E. 26.

1887 ‡ Gahan, Charles Joseph, M.A., D.Sc., (Pres., 1917–18; V.-Pres., 1916, 1919; Sec., 1899–1900; Council, 1893–5, 1901, 1914–19), 8, *Lonsdale-road, Bedford Park*, W. 4; and *British Museum (Natural History), Cromwell-road*, S.W. 7.

1890 Gardner, John, *Laurel Lodge, Hart, West Hartlepool.*
1920 Gardner, J. C. M., *Entomological Dept., Royal College of Science, S. Kensington,* S.W. 7.
1901†‡Gardner, Willoughby, F.L.S., F.S.A., *Deganwy, N. Wales.*
1920 Gauntlett, Harry Leon, F.Z.S., M.R.C.S., L.R.C.P., A.K.C., 45, *Hotham-road, Putney,* S.W. 15.
1913 ‡ de Gaye, J. A., *King's College, Lagos, S. Nigeria.*
1919 ‡ Gedye, Alfred Francis John, P.O. Box 216, *Nairobi, British East Africa.*
1899 ‡ Geldart, William Martin, M.A., 10, *Chadlington-road, Oxford.*
1913 ‡ Gibb, Lachlan, 38, *Blackheath Park, Blackheath,* S.E. 3.
1915 Gibson, Arthur, *Entomological Branch, Dept. of Agriculture, Ottawa, Canada.*
1908 Giffard, Walter M., *P.O. Box* 308, *Honolulu, Hawaii.*
1907 Giles, Henry Murray, Head Keeper of Zoological Gardens, *South Perth, W. Australia.*
1904 ‡ Gilliat, Francis, B.A., *Windham Club, St. James's-square, Piccadilly,* S.W. 1.
1919 Gimingham, Conrad Theodore, O.B.E., F.I.C., *The Cottage, Offchurch,* nr. *Leamington Spa.*
1914 ‡ Godfrey, E. J., Education Dept., *Bangkok, Siam.*
1920 ‡ Goodban, Bernard Sinclair, *Braemar, Belvedere-road, Upper Norwood,* S.E. 19.
1904 Goodwin, Edward, *Canon Court, Wateringbury, Kent.*
1898 ‡ Gordon, J. G. McH., *Corsemalzie, Whauphill S.O., Wigtownshire.*
1898 ‡ Gordon, R. S. G. McH., *Drumblair, Inverness.*
1855 * Gorham, The Rev. Henry Stephen, F.Z.S., (Council, 1882–3), *Highcroft, Great Malvern.*
1913 Gough, Lewis, Ph.D., Entomologist to the Govt. of Egypt, *Dept. of Agriculture, Cairo.*
1909 Gowdey, Carlton C., B.Sc., *Agricultural Department, Jamaica.*
1918 Grace, George, B.Sc., A.R.C.Sc., 23, *Alexander-crescent, Ilkley, Yorks.*
1914 Graveley, F. H., *The Indian Museum, Calcutta.*
1911 ‡ Graves, Major P. P., *Club de Constantinople, Constantinople.*
1891†‡Green, E. Ernest, F.Z.S., (V.-Pres., 1915; Council, 1914–16), *Way's End, Beech-avenue, Camberley.*
1910 ‖ Green, Herbert A., *The Central Fire Station, Durban, Natal.*
1894 Green, J. F., F.Z.S., *City of London Club, Old Broad-street,* E.C. 2.
1893 † Greenwood, Henry Powys, F.L.S., *Whitsbury House, Salisbury.*
1920 Griffin, J. W., 27, *The Summit, Liscard, Wallasey.*
1888 Griffiths, G. C., F.Z.S., *Penhurst,* 3, *Leigh-road, Clifton, Bristol.*
1894 ‡ Grimshaw, Percy H., *Royal Scottish Museum, Edinburgh.*
1905 Grist, Charles J., *The Croft, Carol Green, Berkswill, Coventry.*
1920 ‡ Grosvenor, T. H. L., *Walldeanes, Redhill, Surrey.*
1920 ‡ Gunton, Major H. C., *Seaton Cottage, Gerrard's Cross Common, Bucks.*

1906 Gurney, Gerard H., *Keswick Hall, Norwich.*
1910 Gurney, William B., Asst. Govt. Entomologist, *Department of Agriculture, Sydney, Australia.*

1912 Hacker, Henry, *Queensland Museum, Brisbane, Queensland.*
1919 Hadwen, Dr. Seymour, D.Vet.Sci., *Biological Central Experimental Farm, Ottawa, Canada.*
1906 ‡ Hall, Arthur, 7, *Park-lane-mansions, Croydon.*
1890 †‡ Hall, Albert Ernest, c/o *City Librarian, Surrey-street, Sheffield.*
1885 ‡ Hall, Thomas William, *Wood Grange, Shire-lane, Chorley Wood, Herts.*
1912 Hallett, Howard Mountjoy, 64, *Westbourne-road, Penarth, Glamorganshire.*
1915 Hamm, Albert Harry, 22, *Southfield-road, Oxford.*
1891 ‡ Hanbury, Frederick J., F.L.S., *Brockhurst, E. Grinstead.*
1905 † Hancock, Joseph L., 5454, *University-avenue, Chicago, U.S.A.*
1917 Harding, William G., F.L.S., M.R.S.L., F.R.H.S., *St. George's School, Windsor.*
1920 Hardy, Alister Clavering, 40, *Harlow Moor-drive, Harrogate.*
1903 ‡ Hare, E. J., 4, *New-square, Lincoln's Inn,* W.C. 2.
1920 ‡ Hargreaves, Ernest, *Zoological Dept., Imperial College of Science, S. Kensington,* S.W. 7.
1920 Hargreaves, Harry, *Entomological Dept., Kampala, Uganda.*
1904 ‡ Harris, Edward, 58, *Wilson-street, Finsbury,* E.C. 2.
1910 ‡ Harwood, Philip, 2, *Fern Villas, Melford-road, Sudbury.*
1919 ‡ Hawker-Smith, William, *Speedwell Cottage, Hambledon, Godalming, Surrey.*
1910 Hawkshaw, J. C., *Hollycombe, Liphook, Hants.*
1913 †‡ Hawkshaw, Oliver, 3, *Hill-street, Mayfair,* W. 1.
1919 ‡ Hayward, H. C., M.A., *Repton, Derby.*
1910 ‡ van der Hedges, Alfred, *Mayneshill, Hoggeston, Winslow, Bucks.*
1919 ‡ Hemming, Arthur Francis, 9, *Victoria-grove,* W. 8, and *Treasury Chambers, Whitehall,* S.W. 1.
1910 Henderson, J., c/o Messrs. Osborne & Chappel, *Ipoh, Perak, Federated Malay States.*
1898 Heron, Francis A., B.A., 9, *Park House, Highbury Park,* N. 5.
1918 Herrod-Hempsall, Joseph, *Orchard House, Stockingstone-road, Luton, Beds.*
1903 Herrod-Hempsall, William, *W.B.C. Apiary, Old Bedford-road, Luton, Beds.*
1908 * Hewitt, C. Gordon, D.Sc., Dominion Entomologist, *Department of Agriculture, Ottawa, Canada.*
1913 Hewitt, John, B.A., Director, *Albany Museum, Grahamstown, S. Africa.*
1913 Hill, Gerald F., *Veterinary School, University of Melbourne, Parkville, Victoria, Australia.*

1876 † Hillman, Thomas Stanton, *Eastgate-street, Lewes.*
1907 ‡ Hoar, Thomas Frank Partridge, *Mercia, Albany-road, Leighton Buzzard.*
1917 Hockin, John W., *Castle-street, Launceston.*
1920 Hodge, Albert Ernest, F.Z.S., 14, *Astonville-street, Southfields,* S.W. 18.
1914 Hodge, The Rev. Canon Edward Grose, *The Rectory, Birmingham.*
1912 Hodge, Harold, 91, *Highbury-place,* N. 5.
1888 Hodson, The Rev. J. H., B.A., B.D., *Rhyddington, Clifton Drive, Lytham.*
1902 Hole, R. S., c/o Messrs. King and Co., *Bombay.*
1910 Holford, H. O., *Elstead Lodge, Godalming, Surrey.*
1887 Holland, The Rev. W. J., D.D., Ph.D., *Carnegie Museum, Pittsburgh, Penn., U.S.A.*
1898 Holman-Hunt, C. B., F.Z.S., Systematic Entomologist, Department of Agriculture, *Kuala Lumpur, Federated Malay States.*
1910 ‡ Holmes, Edward Morrell, *Ruthren, Sevenoaks.*
1901 ‡ Hopson, Montagu F., L.D.S., R.C.S.Eng., F.L.S., 7, *Harley-street,* W. 1.
1897 Horne, Arthur, *Boun-na-coile, Murtle, Aberdeenshire.*
1919 de Horrack-Fournier, Mme., 90, *Boulevard Malesherbes, Paris,* and *Château de Voisins, Louveciennes, Seine et Oise, France.*
1903 Houghton, J. T., 1, *Portland-place, Worksop.*
1907 † Howard, C. W., *Canton Christian College, Canton, China.*
1900 Howes, W. George, 259, *Cumberland-street, Dunedin, New Zealand.*
1907 * Howlett, Frank M., *Wymondham, Norfolk.*
1888 Hudson, George Vernon, *Hill View, Karori, Wellington, New Zealand.*
1919 Hugh, Williams, J.P., *Box* 20, *Cloverdale, British Columbia.*
1907 Hughes, C. N., 178, *Clarence Gate-gardens, Regent's Park,* N.W. 1.
1912 Huie, Miss Lily, *Hollywood, Colinton-road, Edinburgh.*
1917 Hunter, David, M.A., M.B., *The Coppice, Nottingham.*

1897 ‡ Image, Prof. Selwyn, M.A., (Council, 1909–11), 78, *Parkhurst-road, Camden-road,* N. 7.
1912†‡ Imms, A. D., D.Sc., M.A., F.L.S., (Vice-President, Council, 1919-), *Rothamsted Experimental Station, Harpenden, Herts.*
1920 Inglis, Charles McFarlane, F.Z.S., M.B.O.U., *Baghownie Factory, Laheria Sarai, Bihar, India.*
1918 Isaacs, P. V., Assistant Entomologist, 2, *Gledhill-terrace, South Kensington,* S.W. 5.

1907 Jack, Rupert Wellstood, Government Entomologist, Department of Agriculture, *Salisbury, Rhodesia.*
1917 ‡ Jackson, Miss Dorothy J., *Swordale, Evanton, Ross-shire.*
1907 ‡ Jackson, P. H., *Ellesmere, The Drive, Sevenoaks.*
1911 ‡ Jacobs, Major J. J., R.E., *Holmesleigh, Burgess Hill, Sussex.*

1920 James, Russell, 7, *Broadlands-road, Highgate*, N. 6.
1914 Janse, A. J. T., 1*st-street, Gezina, Pretoria, S. Africa.*
1869 ‡ Janson, Oliver E., 44, *Great Russell-street, Bloomsbury*, W.C. 1; and *Cestria, Claremont-road, Highgate*, N. 6.
1898 Janson, Oliver J., *Cestria, Claremont-road, Highgate*, N. 6.
1919 ‡ Jeans, Miss Gertrude M., *Penn Court*, 54, *Cromwell-road*, S.W. 7.
1886 Jenner, James Herbert Augustus, *East Gate House, Lewes.*
1909 Jepson, Frank P., *Peradeniya, Ceylon.*
1917 ‡ Jermyn, Col. Turenne, *Highcliffe, Weston-super-Mare.*
1886 John, Evan, *Llantrisant S.O., Glamorganshire.*
1907 Johnson, Charles Fielding, *West Bank, Didsbury-road, Heaton Mersey.*
1917 Johnson, Jesse, *Finca las Marias, Barberena, Guatemala.*
1889 Johnson, The Rev. W. F., M.A., *Acton Rectory, Poyntz Pass, co. Armagh.*
1920 Johnstone, Douglas, *Brooklands, Rayleigh, Essex.*
1908 ‡ Joicey, James J., F.L.S., F.Z.S., F.R.G.S., etc., *The Hill, Witley, Surrey.*
1888 ‡ Jones, Albert H., (V.-Pres., 1912, 1918; Treas., 1904–17; Council, 1898–1900, 1904–1918), *Shrublands, Eltham*, S.E. 9.
1920 ‡ Jones, Rev. Neville, *Hope Fountain, Box* 283, *Bulawayo, Rhodesia, S. Africa.*
1894 †‡ Jordan, Dr. K., (V.-Pres., 1909; Council, 1909–11), *The Museum, Tring.*
1910 ‡ Joseph, E. G., 23, *Clanricarde-gardens*, W. 2.
1910 ‡ Joy, Ernest Cooper, *Eversley, Dale-road, Purley.*
1902 ‡ Joy, Norman H., M.R.C.S., L.R.C.P., *Theade, Berks.*
1919 Jurriaanse, J. H., *W.Z. Schickade, 75, Rotterdam, Holland.*

1911 Kannan, Kunhi, M.A., Asst. Entomologist to the Govt. of Mysore, *Bangalore, South India.*
1896 †‡ Kaye, William James, (Council, 1906–8), *Caracas, Ditton Hill, Surbiton.*
1890 ‡ Kenrick, Sir George H., *Whetstone, Somerset-road, Edgbaston, Birmingham.*
1920 Kent-Lemon, Capt. Arthur Leslie, York & Lancaster Regt., *c/o Postmaster, Khartoum, Sudan*, and *Blytheswood, Ascot, Berks.*
1904 Kershaw, G. Bertram, *Ingleside, West Wickham, Kent.*
1906 Keynes, John Neville, M.A., D.Sc., 6, *Harvey-road, Cambridge.*
1900 Keys, James H., 7, *Whimple-street, Plymouth.*
1919 Khare, Jagamath Layman, Lecturer in Entomology, *Agricultural College, Nagpur, India.*
1912 ‡ King, Harold H., Govt. Entomologist, *Gordon College, Khartoum, Sudan.*
1889 King, Prof. James J. F.-X., 1, *Athole Gardens-terrace, Kelvinside, Glasgow.*

1913 KIRBY, W. Egmont, M.D., *Hilden*, 46, *Sutton Court-road, Chiswick*, W. 4.

1917 ‡ KIRKPATRICK, Thos. W., *The Deanery, Ely*, and *Room* 270, *War Office, Whitehall*, S.W. 1.

1887 † KLEIN, Sydney T., F.L.S., F.R.A.S., *Lancaster Lodge, Kew Gardens, Surrey.*

1920 KNIGHT, V., Assistant Director, *Raffles Museum, Singapore.*

1916 ‡ LAING, Frederick, *Natural History Museum, Cromwell-road*, S.W. 7.

1910 ‡ LAKIN, C. Ernest, M.D., F.R.C.S., 105, *Harley-street*, W. 1.

1911 †‡ LAMBORN, W. A., M.R.C.S., L.R.C.P., *The Malaria Bureau, Kuala Lumpur, Federated Malay States.*

1919 ‖ LAMONT, Sir Norman, Bart., 4, *Queen-street, Mayfair*, W. 1, and *Palmiste, Trinidad, B.W.I.*

1917 LANGHAM, Sir Charles, Bart., *Tempo Manor, Co. Fermanagh.*

1920 LATHY, Percy I., 90, *Boulevard Molesherbes*, and 70, *Boulevard August Blaqui, Paris.*

1912 LATOUR, Cyril Engelhart, *G.P.O., Toronto, Canada.*

1916 LATTA, Prof. Robert, D.Phil., *University of Glasgow.*

1895 LATTER, Oswald H., M.A., *Charterhouse, Godalming.*

1899 LEA, Arthur M., Government Entomologist, *Museum, Adelaide, S. Australia.*

1914 LEECHMAN, Alleyne, M.A., F.L.S., F.C.S., *Corpus Christi College, Oxford;* and *St. Hubert's, Main-street, Georgetown, British Guiana.*

1910 LEIGH, H. S., *The University, Manchester.*

1900 LEIGH-PHILLIPS, Rev. W. J., *Burtle Vicarage, Bridgwater.*

1920 ‡ LEMAN, George Beddome Curtis, *Wynyard*, 52, *West Hill, Putney Heath*, S.W. 15.

1920 ‡ LEMAN, George Curtis, *Wynyard*, 52, *West Hill, Putney Heath*, S.W. 15.

1920 ‡ LEMAN, Sydney Curtis, *Wynyard*, 52, *West Hill, Putney Heath*, S.W. 15.

1903 †‡ LEVETT, The Rev. Thomas Prinsep, *Frenchgate, Richmond, Yorks.*

1876 ‡ LEWIS, George, F.L.S., (COUNCIL, 1878, 1884), 30, *Shorncliffe-road, Folkestone.*

1908 † LEWIS, John Spedan, *High Combe, Balcombe, Surrey;* and 277, *Oxford-street*, W. 1.

1892 LIGHTFOOT, R. M., *South African Museum, Cape Town, Cape of Good Hope.*

1914 ‡ LISTER, J. J., *St. John's College, Cambridge;* and *Merton House, Grantchester, Cambs.*

1903 LITTLER, Frank M., *Box* 114, *P.O., Launceston, Tasmania.*

1865 † LLEWELYN, Sir John Talbot Dillwyn, Bart., M.A., F.L.S., *Penllergare, Swansea.*

1881 † LLOYD, Alfred, F.C.S., *The Dome, Bognor.*

1919 ‡ LLOYD, Llewellyn, Chief Entomologist in N. Rhodesia, *Cartref, Slingsby, Malton, Yorks.*

1885†‡Lloyd, Robert Wylie, (Council, 1900–1), I, 5 and 6, *Albany, Piccadilly*, W. 1.
1920 Lodge, George, *Hawkhouse, Camberley.*
1903 Lofthouse, Thomas Ashton, *The Croft, Linthorpe, Middlesbrough.*
1908 ‡ Longsdon, D., *The Flower House, Southend, Catford*, S.E. 6.
1904†‡Longstaff, George Blundell, M.A., M.D., (V.-Pres., 1909, 1915, 1917 ; Council, 1907–9, 1915–17), *Highlands, Putney Heath*, S.W. 15.
1920 Loveridge, Arthur, *c/o Game Dept., Dar-es-Salaam, E. Africa.*
1893 Lower, Oswald B., *Pinarro, South Australia.*
1901 Lower, Rupert S., *Tranmere, Magill-road, Canyton, S. Australia.*
1898 ‡ Lucas, William John, B.A., (Council, 1904–6), 28, *Knight's Park, Kingston-on-Thames.*
1903 Lyell, G., *Gisborne, Victoria, Australia.*
1912 Lyle, George Trevor, 7, *Scrope-terrace, Cambridge.*
1909 Lyon, Francis Hamilton, 89, *Clarence Gate-gardens, Upper Baker-street*, N.W. 1.

1887 * M'Dougall, James Thomas, *St. Lawrence, Isle of Wight.*
1910 Macdougall, R. Stewart, M.A., D.Sc., F.R.S.E., *Edinburgh University.*
1919 McLeod, Murdoch Campbell, *The Fairfields, Cobham, Surrey*, and c/o McLeod & Son, *Calcutta, India.*
1900 Mackwood, The Hon. F. M., M.L.C., *Colombo, Ceylon.*
1899†‡Main, Hugh, B.Sc., (Council, 1908–10), *Almondale, Buckingham-road, South Woodford*, N.E.
1914 Mallock, J. Russell, State Entomologist's Office, *Urbana, Illinois, U.S.A.*
1905 Mally, Charles William., M.Sc., *Dept. of Agriculture, Cape Town, S. Africa.*
1892 ‡ Mansbridge, William, *Dunraven, Church-road, Wavertree, Liverpool.*
1920 Marriner, Thomas Frederic, 2, *Brunswick-street, Carlisle.*
1894†‡Marshall, Alick.
1895 ‡ Marshall, Guy Anstruther Knox, C.M.G., D.Sc., F.Z.S., (V.-Pres., 1919 ; Council, 1907–8, 1919–), 6, *Chester-place, Hyde Park-square*, W. 2.
1896 Marshall, P., M.A., B.Sc., F.G.S., *University School of Mines, Dunedin, New Zealand.*
1897 Martineau, Alfred H., *Barum, Crewkerne, Somerset.*
1919 Marumo, N., *Zoological Institute, Agricultural College, Imperial University, Komaba, Tokyo, Japan.*
1920 Mason, Frank Reginald, *Oxford, Harpenden, Herts.*
1895 Massey, Herbert, *Ivy-Lea, Burnage, Didsbury, Manchester.*
1865 Mathew, Gervase F., F.L.S., Paymaster-in-chief, R.N., (Council, 1887), *Lee House, Dovercourt, Harwich.*
1887 Matthews, Coryndon, *Stentaway, Plymstock, S. Devon.*

1912 Maulik, Prof. S., *Dept. of Zoology, University of Calcutta, Calcutta, India.*

1900 ‡ Maxwell-Lefroy, H., *Imperial College of Science and Technology, South Kensington*, S.W.

1916 ‡ May, Harry Haden, *Blackfriars House, Plymouth.*

1913 ‡ Meaden, Louis, *Melbourne, Dyke-road, Preston, Brighton.*

1920 ‡ Meldola, Mrs. Ella Frederica, 6, *Brunswick-square*, W.C. 1.

1919 Mellows, Charles, M.A., *The College, Bishop's Stortford.*

1885 Melvill, James Cosmo, M.A., F.L.S., *Meole Brace Hall, Shrewsbury.*

1907 ‡ Melville, Mrs. Catharine Maria, *Kapai, Elburton, S. Devon.*

1887 ‡ Merrifield Frederic, (Pres., 1905–6 ; V.-Pres., 1893, 1907 ; Sec., 1897–8 ; Council, 1894, 1899), 14, *Clifton-terrace, Brighton.*

1912 Metcalfe, Rev. J. W., *St. Luke's House, Torquay.*

1880 ‡ Meyrick, Edward, B.A., F.R.S., F.Z.S., *Thornhanger, Marlborough.*

1919 Miles, Herbert William, N.D.A., *The Gardens, Sydney Park, Gloucester.*

1883 ‡ Miles, W. H., c/o E. Step, Esq., 158, *Dora-road, Wimbledon Park*, S.W. 19.

1913 ‖ Miller, F. V. Bruce, *Livingstone, N. Rhodesia, Africa.*

1905 ‡ Mitford, Robert Sidney, C.B., 9, *Beaconsfield-terrace, Hythe, Kent.*

1914 Miyaké, Dr. Tsunekata, *The Agricultural College, Tokyo Imperial University, Komaba, Tokyo, Japan.*

1902 ‡ Montgomery, Arthur Meadows, 34, *Shalimar Gardens, Acton*, W. 3.

1899 ‡ Moore, Harry, 12, *Lower-road, Rotherhithe*, S.E. 16.

1916 Moore, Ralph Headley, B.A., *Heathfield, Plymstock, Devon.*

1886 Morgan, A. C. F., F.L.S., 135, *Oakwood-court, Kensington*, W. 14.

1889 † ‡ Morice, The Rev. F. D., M.A., F.Z.S., Fellow of Queen's College, Oxford, (Pres., 1911, 1912, V.-Pres., 1902, 1904, 1913, 1919 ; Council, 1902–4, 1918–), *Brunswick, Mount Hermon, Woking.*

1895 † ‡ Morley, Claude, F.Z.S., *Monk Soham House, Suffolk.*

1920 Morris, Hubert Meridydd, M.Sc., *Institute of Plant Pathology, Rothamsted Experimental Station, Harpenden, Herts.*

1893 Morton, Kenneth J., 13, *Blackford-road, Edinburgh.*

1910 ‡ Mosely, Martin E., 94, *Campden Hill-road, Kensington*, W. 8.

1882 Mosley, S. L., *Ravensknowle Museum, Huddersfield.*

1911 ‡ Moss, Rev. A. Miles, c/o Messrs. Booth & Co., *Para, Brazil.*

1907 † ‡ Moulton, John C., O.B.E., M.A., B.Sc., F.Z.S., &c., Director, *Raffles Museum and Library, Singapore, Straits Settlements*, and *The Hall, Bradford-on-Avon.*

1911 Mounsey, J. Jackson, 24, *Glencairn-crescent, Edinburgh.*

1901 † ‡ Muir, Frederick, *H.S.P.A. Experiment Station, Honolulu, Oahu, H.I.*

1912 † Mullan, Jal Phirozshah, M.A., F.L.S., F.Z.S., Professor of Biology, *St. Xavier's College, Lamington-road, Grant Road Post, Bombay, India.*

1869†‡Müller, Albert, F.R.G.S., (Council, 1872–3), c/o Herr A. Müller-Mechel, *Grenzacherstrasse* 60, *Basle, Switzerland.*
1920 Munro, Hugh Kenneth, B.Sc., 258, *Bourke-street, Pretoria, S. Africa.*
1918 Munro, Lieut. James W., R.A.M.C., *Forestry Commission*, 22, *Grosvenor-crescent*, S.W. 1.
1914 Murray, George H., *The Residency, Kerema Gulf Division, Papua.*
1917 Muschamp, Percy A. H., *Charterhouse School, Godalming.*
1909 Musham, John F., 48, *Brook-street, Selby, Yorks.*

1903‡ Neave, S. A., M.A., D.Sc., F.Z.S., Secretary, (V.-Pres., 1918; Council, 1916–), 41, *Queen's Gate*, S.W. 7, and *Bishop's House, Beaconsfield, Bucks.*
1919‡ Nell, Louis, *Imperial Bureau of Entomology*, 41, *Queen's Gate*, S.W. 7.
1919 Nelson, William George Frazer, 6, *Craven Hill*, W. 2.
1901‡ Nevinson, E. B., *Morland, Cobham, Surrey.*
1907‡ Newman, Leonard Woods, *Bexley, Kent.*
1913 Newman, Leslie John William, *Bernard-street, Claremont, W. Australia.*
1909 Newstead, Alfred, *The Grosvenor Museum, Chester.*
1890‡ Newstead, Prof. Robert, M.Sc., F.R.S., A.L.S., Hon. F.R.H.S., Dutton Memorial Professor of Entomology, *The School of Tropical Medicine, University of Liverpool.*
1914‡ Nicholson, Charles, 35, *The Avenue, Hale-end, Chingford*, E. 4.
1909‡ Nicholson, Gilbert W., M.A., M.D., (Council, 1913–15), *Oxford and Cambridge Club, Pall Mall*, S.W. 1.
1918‡ Nimmy, Ernest William, 210, *Whippendell-road, Watford, Herts.*
1906 Nix, John Ashburner, *Tilgate, Crawley, Sussex.*
1916 Nohira, Akio, *Tchijoji, Otagigun, Kyoto, Japan.*
1914 Norris, Frederic de la Mare, *The Agricultural Department, Kuala Lumpur, Federated Malay States.*
1915 Northcote, Dr. A. B., 4, *Columbia-road, Bethnal Green*, E. 2.
1895 Nurse, Lt.-Colonel C. G., 145, *Beaufort-street, Chelsea*, S.W. 3.

1877 Oberthür, René, *Rennes (Ille-et-Vilaine), France.*
1893†‖Ogle, Bertram S., *Steeple Aston, Oxfordshire.*
1910‡ Oldaker, Francis A., M.A., *The Red House, Haslemere.*
1918 O'Neil, Rev. Fr., S.J., *P.O. Box* 54, *Salisbury, Rhodesia, S. Africa.*
1913‡ Ormiston, Walter, *Kalupahani, Haldummulle, Ceylon.*

1895‡ Page, Herbert E., (Council, 1918–), *Bertrose, Gellatly-road, St. Catherine's Park*, S.E. 15.
1916 Palmer, Arthur Raymond, *Inglcholme, Norton Way, Letchworth, Herts.*
1919 Paravicini, Louis, *Villa Alucita, Arlesheim, Bâle, Switzerland.*

1918 Parris, R. Stanway, *Beachleigh, Kingsgate, Broadstairs.*
1918 Parsons, Dr. Allan Chilcott, M.R.C.S., L.R.C.P., D.Ph., etc., *Walton Lodge, Surbiton-road, Kingston-on-Thames.*
1919 Patton, Major W. J., I.M.S., *Stoke St. Gregory, nr. Taunton.*
1913 Peacock, Alexander David, *Armstrong College, Newcastle-on-Tyne.*
1911 ‡ Pearson, Douglas, *Chilwell House, Chilwell, Notts.*
1916 ‡ Peebles, Howard M., 13, *Chesham-street,* S.W. 1.
1919 Peed, John, *Whittlesey, Cambs.*
1915 Peile, Lt.-Col. Harry Diamond, I.M.S., *c/o Alliance Bank of Sind, Peshawar, India.* [Transactions to H. F. G. Watkins, 38, *Denbigh-road, West Ealing,* W. 13.]
1914 ‡ Pendlebury, Major Wm. J. von Monté, *Broadlands, Shrewsbury,* and *Keble College, Oxford.*
1883 Péringuey, Louis, D.Sc., F.Z.S., Director, *South African Museum, Cape Town, South Africa.*
1903 † Perkins, R. C. L., M.A., D.Sc., F.Z.S., *Park Hill House, Paignton, Devon;* and Board of Agriculture, Division of Entomology, *Honolulu, Hawaii.*
1907 † Perrins, J. A. D., 3rd Seaforth Highlanders, *Davenham, Malvern.*
1897 ‡ Phillips, Capt. Hubert C., M.R.C.S., L.S.A., 17, *Hereford-road, Bayswater,* W. 2.
1903†‡ Phillips, Montagu A., F.R.G.S., F.Z.S., *Devonshire House Preparatory School, Reigate.*
1920 Philpott, A., Assistant Entomologist, Biological Dept., *Cawthron Institute of Scientific Research, Nelson, New Zealand.*
1917 ‡ Pickard-Cambridge, Arthur D., M.A., *Balliol College, Oxford.*
1891 ‡ Pierce, Frank Nelson, *The Old Rectory, Warmington, Oundle, Northants.*
1913 Platt, Ernest Edward, 403, *Essenwood-road, Durban, Natal.*
1885 van der Poll, J. R. H. Neerwort, *Poste restante, Geneva, Switzerland.*
1919 Pomeroy, Arthur W. Jobbins, Government Entomologist in Nigeria, *Ibadan, S. Nigeria,* and *Kneesworth House,* 78, *Elm Park-road, S. Kensington,* S.W. 7.
1870†‡ Porritt, Geo. T., F.L.S., (Council, 1887), *Elm Lea, Dalton, Huddersfield.*
1884†‡ Poulton, Professor Edward B., D.Sc., M.A., F.R.S., F.L.S., F.G.S., F.Z.S., Hope Professor of Zoology in the University of Oxford, (Pres., 1903–4; V.-Pres., 1894–5, 1902, 1905; Council, 1886–8, 1892, 1896, 1905–7), *Wykeham House, Banbury-road, Oxford.*
1905 Powell, Harold, 7, *Rue Mireille, Hyères (Var), France.*
1919 Praed, Cyril Winthrop Mackworth, *Dalton Hill, Albury, Surrey.*
1908 ‡ Pratt, William B., 10, *Lion Gate Gardens, Richmond, Surrey.*
1878 Price, David, 48, *West-street, Horsham.*
1908 ‡ Prideaux, Robert M., (Council, 1917), *Woodlands, Brasted Chart, Sevenoaks.*

1920 Prior, W. H. T., *Culban, Main-road, New Eltham, Kent.*
1904 ‡ Priske, Richard A. R., 9, *Melbourne Avenue, West Ealing.*
1920 Prout, Miss Alice Ellen, *Lane End, Hambledon, Surrey.*
1893 ‡ Prout, Louis Beethoven, (Council, 1905–7), 84, *Albert-road, Dalston, E. 8.*
1910 Punnett, Professor Reginald Crundall, M.A., *Cains College, Cambridge.*

1912 Rait-Smith, W., *Hollybrook, Rose Heyworth-road, Abertillery, Monmouthshire.*
1914 Ramakrishna, T. V. Aiyar, B.A., F.Z.S., *The Agricultural College, Coimbatore, S. India.*
1920 ‡ Rambousek, Dr. F. G., M.P., vii/1169, *Prague, Czechoslovakia.*
1913 Rao, K. Ananthaswamy, *Curator of the Government Museum, Bangalore, India.*
1916 Rao, Yelseti Ramachandra, M.A., *Agricultural Dept., Kanadah, Baghdad, Mesopotamia.*
1920 Raymundo, Prof. Benedicto, Director of the Agricultural Society's Museum, 76, *rua Senador Alencar, Rio di Janeiro, Brazil.*
1907 ‡ Rayward, Arthur Leslie, 52, *Addiscombe-road, Croydon.*
1898 Reuter, Professor Enzio, *Helsingfors, Finland.*
1910 ‡ de Rhé-Philipe, G. W. V., Chief Examiner of Accounts, North-Western Rwy., *Abbott-road, Lahore, India.*
1920 ‡ Rhynehart, John George, A.R.C.Sc.I., N.D.A., *Imperial College of Science, S. Kensington,* S.W. 7.
1920 ‡ Richards, Philip Bernard, 7, *Churchways-crescent, Horfield, Bristol.*
1920 ‡ Richardson, Arthur Walter, 28, *Avenue-road, Southall, Middlesex.*
1912 ‡ Riley, Capt. Norman Denbigh, 9, *Mowbray-road, Upper Norwood,* S.E. 19, and *British Museum (Natural History), S. Kensington,* S.W. 7.
1908 ‡ Rippon, Claude, M.A., 28, *Springfield House, Abingdon.*
1917 Roberts, A. W. Rymer, M.A., *Rothamsted Experimental Station, Harpenden.*
1905 Robinson, Herbert C., *Curator of State Museum, Kuala Lumpur, Selangor.*
1904 ‡ Robinson, Lady, *Worksop Manor, Notts.*
1869 † Robinson-Douglas, William Douglas, M.A., F.L.S., F.R.G.S., *Orchardton, Castle Douglas.*
1908 Rogers, The Rev. K. St. Aubyn, M.A., *P.O. Box 395, Nairobi, British East Africa.*
1907 ‡ Rosenberg, W. F. H., 57, *Haverstock-hill,* N.W. 3.
1868 ‡ Rothney, George Alexander James, *Pembury, Tudor-road, Upper Norwood,* S.E.
1888 †‡ Rothschild, The Right Hon. Lord, D.Sc., F.R.S., F.L.S., F.Z.S., Vice-President, (Council, 1900, 1919), *Zoological Museum, Tring.*

1894†‡Rothschild, The Hon. Nathaniel Charles, M.A., F.L.S., F.Z.S., (Pres., 1915–16 ; V.-Pres., 1914, 1917 ; Council, 1904, 1913–17), *Arundel-house, Kensington Palace Gardens*, W. 8.

1890 ‡ Routledge, G. B., *Tarn Lodge, Heads Nook, Carlisle.*

1913 ‖ Rowden, Alfred Oliver, 3, *Archibald-road, Exeter.*

1887 ‡ Rowland-Brown, Henry, M.A., (V.-Pres., 1908, 1910 ; Sec., 1900–10 ; Council, 1914–16), *Oxhey-grove, Harrow Weald.*

1892 ‡ Russell, S. G. C., *Roedean, The Avenue, Andover.*

1919 ‡ St. Aubyn, Capt. John G., c/o Sir Charles McGrigor & Co., 39, *Panton-street, Haymarket*, S.W. 1.

1920 St. John, Dr. Winstan St. Andrew, M.R.C.S., L.R.C.P., *Derwent House, Derby.*

1905 St. Quintin, W. H., *Scampton Hall, Rillington, York.*

1906 Sampson, Colonel F. Winn, 115, *Tannsfield-road, Sydenham.*

1910 ‡ Saunders, H. A., *St. Ann's, Reigate.*

1901 Schaus, W., F.Z.S., *U.S. National Museum, Washington, D.C.*

1920 Schlupp, W. F., B.Sc., *School of Agriculture & Experiment Station, Potchefstroom, Transvaal.*

1907 ‡ Schmassmann, W., *Beulah Lodge, London-road, Enfield*, N.

1912 Schunck, Charles A., *Ewelme, Wallingford.*

1911 ‡ Scorer, Alfred George, *Hill Crest, Chilworth, Guildford.*

1909 ‡ Scott, Hugh, M.A., D.Sc., Curator in Entomology, *University Museum of Zoology, Cambridge.*

1920 ‡ Seabrook, Lieut. J., 8, *Warwick-place West, Belgravia*, S.W. 1.

1911 Selous, Cuthbert F., M.D., M.R.C.S., L.R.C.P., 25, *Church-road, Tunbridge Wells.*

1911†‡Sennett, Noel Stanton, 24, *de Vere-gardens, Kensington*, W. 8.

1862 ‡ Sharp, David, M.A., M.B., F.R.S., F.L.S., F.Z.S., (Pres., 1887–8 ; V.-Pres., 1889, 1891–2, 1896, 1902–3 ; Sec., 1867 ; Council, 1893–5, 1902–4), *Lawnside, Brockenhurst, Hants.*

1915 Shaw, Dr. A. Eland, c/o R. Kelly, Esq., Solicitor, 59, *Swanston-street, Melbourne, Victoria, Australia.*

1886 Shaw, George T. (Librarian of the Liverpool Free Public Library), *William Brown-street, Liverpool.*

1905 ‡ Sheldon, W. George, F.Z.S., (Vice-President, Treasurer, 1918–), *Youlgreave, South Croydon.*

1900†‡Shepheard-Walwyn, H. W., M.A., *Dalwhinnie, Kenley, Surrey.*

1887†‡Sich, Alfred, (Council, 1910–12), *Corney House, Chiswick*, W. 4.

1911 ‡ Simes, James A., *Greenacres, Woodside-road, Woodford Green, Essex.*

1904 ‡ Simmonds, Hubert W., *Sussex View, Cumberland-gardens, Tunbridge Wells.*

1913 ‖ Sitwell, Capt. F., *Wooler, Northumberland.*

1920 ‡ Skaife, George Harold, M.A., *Agricultural Dept., Cape Town, S. Africa.*

1902 ‡ Sladen, Frederick William Lambart, 44, *Gwynne-avenue, Ottawa, Canada.*

1902 ‡ Sloper, Gerard Orby, F.Z.S., J.P., *Badminton Club, Piccadilly*, W. 1.
1907 ‡ Sly, Harold Baker, *Kingston, Homestead-road, Edenbridge, Kent.*
1906 ‡ Smallman, Raleigh S., *Eliot Lodge, Albemarle-road, Beckenham, Kent.*
1916 Smart, Capt. H. Douglas, R.A.M.C., *Shelley, Huddersfield.*
1920 ‡ Smee, C., 6, *Wildwood-road, Golders Green*, N.W. 4.
1915 ‡ Smith, Adam Charles, *Horton, Mornington-road, Woodford Green.*
1901 Smith, Arthur, *County Museum, Lincoln.*
1911 ‡ Smith, B. H., B.A., *Front Court, Frant, Tunbridge Wells.*
1918 Smith, Patrick Aubrey Hugh, *Sconner House, St. German's, Cornwall*, and 28, *Bruton-street, Berkeley-square*, W.
1912 ‡ Smith, Roland T., 131, *Queen's-road, Wimbledon*, S.W. 19.
1919 Smith, S. Gordon, *Estyn, Boughton, Cheshire.*
1918 † Smith, William Proctor, F.Z.S., *Haddon House, Ashton-on-Mersey.*
1898 ‖ Sopp, Erasmus John Burgess, F.R.Met.S., *Ferndale-road, Hove.*
1885 ‡ South, Richard, (Council, 1890–1), 4, *Mapesbury-court, Shoot-up Hill, Brondesbury*, N.W. 2.
1916 ‡ Sowerby, F. W., *Sea View, Little Haven, Pembrokeshire.*
1920 Spencer, John William, 5, *Dogford-road, Royton, Oldham, Lancashire.*
1908 ‡ Speyer, Edward R., *Ridgehurst, Shenley, Herts.*
1919 ‡ Staniland, L. N., *Trewint, Coppett's-road, Muswell Hill*, N. 10.
1910 Stanley, The Rev. Hubert George, *Marshfield Vicarage, Cardiff.*
1919 Stansfield, Capt. Leslie Rawdon, R.G.A., c/o *Army and Navy Club, Pall Mall*, S.W. 1.
1910 ‡ Stenton, Rupert, *Ministry of Agriculture, Milton-road, Harpenden, Herts.*
1920 Stidston, Engineer-Commander S. T., R.N., *H.M.S. Douglas, South Queensferry.*
1918 ‡ Stiff, Rev. Alfred T., *All Souls' Vicarage, Brighton.*
1910 ‡ Stoneham, Hugh Frederick, Capt. 1st Batt. E. Surrey Regt., *Stoneleigh, Reigate.*
1913 Storey, Gilbert, *Dept. of Agriculture, Cairo, Egypt.*
1915 ‡ Stott, Charles Ernest, *Euton, London-road, Reigate.*
1896 ‡ Strickland, T. A. Gerald, *Southcott, Poulton, Fairford.*
1919 Susainathan, P., Assistant in Entomology, *College of Agriculture and Research Institute, Coimbatore, S. India.*
1884 Swinhoe, Colonel Charles, M.A., F.L.S., F.Z.S., (V.-Pres., 1894; Council, 1891–3; 1902–4), 4, *Gunterstone-road, West Kensington*, W. 14.
1894 ‡ Swinhoe, Ernest, 4, *Gunterstone-road, West Kensington*, W. 14.
1876 ‡ Swinton, A. H., *Oak Villa, Bruishfield, Romsey, Hants.*
1911 ‡ Swynnerton, C. F. M., *Game Warden's Office, Tanganyika Territory.*
1920 ‡ Syms, Edgar E., 22, *Woodlands-avenue, Wanstead*, E. 11.

1910 TAIT, Robt., junr., *Roseneath, Harborough-road, Ashton-on-Mersey.*
1908 ‡ TALBOT, G., *Mon Plaisir, Wormley, Surrey.*
1920 ‡ TAMS, W. H., 8, *Whitla-road, Manor Park,* E. 12.
1918 TAPP, Mrs. Eleanor Eva, *Loos,* 88, *Wickham Way, Beckenham, Kent.*
1918 TAPP, Capt. William Henry, F.R.A.S., F.R.G.S., *Loos,* 88, *Wickham Way, Beckenham, Kent.*
1916 TATCHELL, Leonard Spencer, 43, *Spratt Hall-road, Wanstead,* E. 11.
1911 TAYLOR, Frank H., *Box* 137, *G.P.O., Sydney, N.S.W.*
1903 TAYLOR, Thomas Harold, M.A., *Yorkshire College, Leeds.*
1914 TEMPERLEY, Reginald, *Sharpe House, Wiveliscombe, Somerset.*
1919 ‡ TEMPLE, Major Watkin, *East Mersea, Essex.*
1910 ‡ THEOBALD, Prof. F. V., M.A., *Wye Court, Wye, Kent.*
1901 THOMPSON, Matthew Lawson, 40, *Gosford-street, Middlesbrough.*
1892 THORNLEY, The Rev. A., M.A., F.L.S., *Hughenden, Coppice-road, Nottingham.*
1907 ‡ TILLYARD, Robin John, M.A., D.Sc., F.L.S., Chief of the Biological Dept., *Cawthron Inst. of Scientific Research, Nelson, New Zealand,* and *Maitai Lodge, Bridge-street, Nelson, N.Z.*
1920 TINSLEY, Joseph, *West of Scotland Agricultural College, Burns-avenue, Kilmarnock.*
1911 ‡ TODD, R. G., 54, *Hornsey-lane, Highgate,* N.
1897 TOMLIN, J. R. le B., M.A., (COUNCIL 1911–3), *Lakefoot, Hamilton-road, Reading.*
1907 ‡ TONGE, Alfred Ernest, (COUNCIL, 1915–17), *Aincroft, Reigate, Surrey.*
1920 TONGE, Alfred E., *Ashville, Trafford-road, Allerley Edge, Cheshire.*
1914 DE LA TORRE BUENO, J. R., 11, *North Broadway, White Plains, New York, U.S.A.*
1911 ‡ TOWER, P. H., *Marine Cottage, Eastcliff, Dover.*
1907 TRAGARDH, Dr. Ivar, *The University, Upsala, Sweden.*
1919 TULLETT, Austin Augustus, *The Hill Museum, Witley, Surrey.*
1906 ‡ TULLOCH, Col. B., C.B., C.M.G., *The King's Own Yorkshire Light Infantry, Crown Hill Hutment Camp, Plymouth.*
1895 ‡ TUNALEY, Henry, *Castleton, Searle-road, Farnham.*
1910 TURATI, Conte Emilio, 4, *Piazza S. Alessandro, Milan, Italy.*
1898 ‡ TURNER, A. J., M.D., *Wickham Terrace, Brisbane, Australia.*
1893 ‡ TURNER, Henry Jerome (COUNCIL, 1910–12), 98, *Drakefell-road, New Cross,* S.E. 14.
1906 ‡ TURNER, Rowland E., (COUNCIL, 1909–10), *British Museum (Natural History), S. Kensington,* S.W. 7.
1915 TYTLER, Brigadier-Gen. H. C., C.M.G., C.I.S., D.S.O., *Delhi, India.*

1893 ‡ URICH, Frederick William, C.M.Z.S., *Port of Spain, Trinidad, British West Indies.*
1920 UVAROFF, Dr. B., *Natural History Museum, S. Kensington, S.W.* 7.

1904 †‡ VAUGHAN, W., *The Old Rectory, Beckington, Bath.*

1914 ‡ Veitch, Robert, Entomologist, c/o C.S.R. Co., *Lantoka Mills, Lantoka, Fiji Islands.*
1909 Vidler, Leopold A., *The Carmelite Stone House, Rye.*
1911 Vitalis de Salvaza, R., *Institut Scientifique, Boîte postale No.* 64, *Saigon, Indo-China.*

1897 ‡ Wainwright, Colbran J., (Council, 1901, 1912–14), *Daylesford, Handsworth Wood, Birmingham.*
1918 Walford, Lionel Julian, *The Cavalry Club, Piccadilly,* W.
1878 ‡ Walker, James J., M.A., R.N., F.L.S., President, (V.-Pres., 1916; Sec. 1899, 1905–1918; Council, 1894), *Aorangi, Lonsdale-road, Summertown, Oxford.*
1912 Wallace, Henry S., c/o R. S. Bagnall & Sons, Ltd., 15, *Grey-street, Newcastle-on-Tyne.*
1920 Wallace, William, M.B., 15, *Hainton-avenue, Grimsby.*
1914 Walsh, Mrs. Maria Ernestina, *Soekaboemi, Java, Dutch East Indies.*
1920 Walters, Owen Huth, *Forest Office, Lahore, India.*
1919 Ward, James Davis, *Limehurst, Grange-over-Sands, Lancs.*
1910 ‡ Ward, John J., *Rusinurbe House, Somerset-road, Coventry.*
1908 ‡ Warren, Brisbane C. S., *Pikescot, Pike's Hill-avenue, Lyndhurst.*
1901 † Waterhouse, Gustavus A., B.Sc., F.C.S., *Allonvie, Stanhope-road, Killara, New South Wales, Australia.*
1914 ‡ Waterston, Capt. the Rev. James, B.D., B.Sc., (Council, 1919–), 21, *Arlington Park-mansions, Chiswick,* W. 4; and *British Museum (Natural History), S. Kensington,* S.W. 7.
1919 ‡ Watson, E. B., *The Grange, Winthorpe, Newark.*
1918 Watson, John Henry, 70, *Ashford-road, Withington, Manchester.*
1914 Watt, Morris N., *St. John's Hill, Wanganui, New Zealand.*
1893 ‡‖ Webb, John Cooper, 89, *Dulwich Village,* S.E. 21.
1876 † ‡ Western, E. Young, 27, *Pembridge-square, Notting Hill Gate,* W. 2.
1906 ‡ Wheeler, The Rev. George, M.A., F.Z.S., (Secretary, 1911– ; V.-Pres., 1914), 28, *Gordon-Square,* W.C. 1.
1910 ‡ White, Major Edward Barton, M.R.C.S., *Welsh Metropolitan War Hospital, Whitchurch, Cardiff.*
1918 White, Ronald Senior, *Suduganga Estate, Matale, Ceylon.*
1913 † ‡ Whitley, Percival N., *Brantwood, Halifax*; and *New College, Oxford.*
1913 † Whittaker, Oscar, F.R.M.S., *Box* 552, *Chilliwack, British Columbia.*
1911 Whittingham, Ven. Archdeacon W. G., *Glaston Rectory, Uppingham.*
1919 Whittle, F. G., 7, *Marine-avenue, Southend-on-Sea.*
1917 ‡ Wickham, Rev. Prebendary A. P., *East Brent Vicarage, Highbridge, Somerset.*
1906 Wickwar, Oswin S., *Woodford, Maitland Crescent, Colombo, Ceylon.*
1903 ‡ Wiggins, Clare A., M.R.C.S., *Watcombe, Park Town, Oxford.*
1896 ‡ Wileman, A. E., *Lane End, Westcott, nr. Dorking.*
1911 ‡ Williams, C. B., M.A., *Port of Spain, Trinidad,* and 20, *Slatey-road, Birkenhead.*

1915 Williams, Harold Beck, 131, *Queen's-road, Wimbledon*, S.W. 19.
1920 Wilson, G. F., *Ent. Dept., R.H.S. Laboratory, Wisley, Ripley, Surrey.*
1919 Wilson, Lt.-Col. R. S., Governor of Western Desert Province, *Mersa Matruh, Egypt.*
1915 Winn, Albert F., *Library of McGill University, Westmount, Montreal, Canada.*
1919 Winterscale, J., *Sungei Klah Estate, Sungkai, Perak.*
1920 ‡ Withycombe, Cyril Luckes, 12, *Prospect-hill, Walthamstow.*
1919 Wood, H. Worsley, 31, *Agate-road, Hammersmith*, W. 6.
1905 Woodbridge, Francis Charles, *Briar Close, Latchmore-avenue, Gerrard's Cross S.O., Bucks.*
1914 ‡ Woodforde, Francis Cardew, B.A., c/o *University Museum, Hope Department, Oxford.*
1918 Woodruffe-Peacock, Rev. E. Adrian, F.L.S., F.G.S., *Cadney Vicarage, Brigg, Lincolnshire.*
1919 Wytsman, P., *Quatre Bras, Tervueren, Belgium.*

1892 Youdale, William Henry, F.R.M.S., 21, *Belle Isle-street, Workington.*

BENEFACTIONS.

List of Donations of the amount or value of Twenty pounds and upwards.

1861.

H. T. Stainton, £25.*

1862.

Rev. F. W. Hope, his library.

1864.

J. W. Dunning, £123 5*s.*

1867.

The same, towards cost of publications, £105.

1868.

H. J. Fust, towards the cost of his paper on Geographical Distribution, £25.

The Royal Society, for the same, £25.

1869.

J. W. Dunning, £50.

W. W. Saunders, cost of drawing and engraving 24 plates for Pascoe's "Longicornia Malayana."

1870.

J. W. Dunning, £20.

The same, the entire stock of eight vols. of the Transactions.

1872.

The same, towards cost of publications, £50.

1875.

The same, cost of removal of Library and new book-cases, £99 17*s.* 4*d.*

1876.

The same, towards cost of publications, £50.

1879.

H. T. Stainton, £20 10*s.* 6*d.*

* It has not been always possible to find the exact purpose for which the earlier money gifts were intended, but they appear to have been usually in support of the publications.

1880.

The same, £20.

1881.

J. W. Dunning, towards cost of publications, £40.

H. T. Stainton, for the same, £25.

1882.

The same, £30.

1883.

The same, £35.

1884.

J. W. Dunning, £50.

H. T. Stainton, £40.

W. B. Spence, his late father's library.

1885.

J. W. Dunning, £35.

The same, the whole cost of the Society's Charter.

1893.

The same, towards cost of publishing the Library Catalogue, £25.

1894.

The same, £45.

The Misses Swan, £250 for the "Westwood Bequest," the interest to be used for plates in the Transactions.

F. D. Godman (in this and subsequent years), "Biologia Centrali-Americana."

1898.

Mrs. Stainton, about 800 volumes and pamphlets from H. T. Stainton's Library.

1899.

S. Stevens, legacy, £100.

1902.

G. W. Palmer, M.P., towards cost of printing G. A. K. Marshall's paper on the Bionomics of African Insects, £30.

Prof. E. B. Poulton, towards cost of plates, £65.

1903.

H. J. Elwes, cost of plates to illustrate his paper on the Butterflies of Chile, £36 18*s.* 2*d.*

F. D. Godman, cost of plates to illustrate his paper on Central and S. American *Erycinidae*.

1904.

H. L. L. Feltham, towards cost of plates for R. Trimen's paper on S. African Lepidoptera, £20.

1906.

The same, towards cost of plates for R. Trimen's paper on African Lepidoptera, £20.

1908.

E. A. Elliott (in this and subsequent years), Wytsman's "Genera Insectorum."

1909.

Ch. Oberthür (in this and subsequent years), his "Lépidoptérologie comparée."

1910.

Dr. T. A. Chapman, towards cost of plates for his papers on Life-histories of Lepidoptera, £25.

1911.

Sir G. Kenrick, Bart., cost of plates for his paper on Butterflies of Dutch New Guinea, £54.

1912.

Dr. T. A. Chapman, cost of plates for his papers on Life-histories of Lepidoptera, £35 6*s.* 5*d.*

1913.

The Royal Society, towards the publication of D. Sharp's paper on the Genitalia of Coleoptera, £60.

1914.

F. D. Godman, cost of plates for G. C. Champion's papers on Mexican and Central American Coleoptera, £22 7*s.* 6*d.*

G. T. Bethune-Baker, cost of 12 plates illustrating his Presidential Address.

1915.

J. J. Joicey, cost of plates for his papers on Lepidoptera from Dutch New Guinea, £82 11*s.*

Dr. G. B. Longstaff, cost of plates for Dr. Dixey's paper on New Pierines, £32.

Prof. R. Meldola, legacy (subject to the life-interest of Mrs. Meldola), £500.

1916.

Dr. T. A. Chapman, for plates, £68 7*s.* 3*d.*

1917.

Mrs. Meldola, for books for the Library, £31 10*s.*

E. E. Green, large binocular microscope.

1919.

Dr. T. A. Chapman, F.R.S., cost of plates to illustrate his papers, £56 19*s.* 3*d.*

1920.

Donations in aid of the purchase of 41 Queen's Gate—

Dr. G. B. Longstaff, £1000.

The Honble. N. C. Rothschild, £500.

Dr. H. Eltringham, Sir G. H. Kenrick, The Rev. F. D. Morice, W. G. Sheldon, each £100.

R. Adkin, G. T. Bethune-Baker, Dr. T. A. Chapman, W. M. Christy, H. Massey, Prof. E. B. Poulton, each £50.

B. H. Crabtree, E. E. Green, Dr. G. A. K. Marshall, G. A. J. Rothney, each £25.

H. E. Andrewes, £21.

H. J. Elwes, E. B. Nevinson, G. T. Porritt, O. Whittaker, each £20.

Dame Alice Godman, book-shelves and fittings for the Library.

J. J. Joicey, in aid of the furnishing of 41 Queen's Gate, £100.

Dr. T. A. Chapman, F.R.S., cost of plate to illustrate his paper, £30.

Smithsonian

TRANSACTIONS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1920.

I. *A Contribution to the Classification of the Coleopterous family* Endomychidae. By GILBERT J. ARROW, F.Z.S.

[Read November 5th, 1919.]

PLATE I.

THE British Museum collection of this beautiful group of fungus-feeding beetles is a peculiarly rich one, and contains a very large proportion of all the known species, now about 750 in number. The Gorham collection, bought in 1891, contained, in addition to Mr. Gorham's own types, many of those of Gerstaecker and Guérin, whilst many more Gorham types were afterwards acquired with the important Godman-Salvin and Fry collections. In amalgamating these valuable collections very numerous errors contained in the recent catalogue of Oziki (for a large proportion of which Mr. Gorham is responsible) have come under my notice, and in putting on record the notes thus accumulated I have taken the opportunity of describing some of the more interesting of the hitherto unknown genera and species contained in the National Collection, a large part of these due to the successful collecting of Mr. Gilbert Bryant and the late W. Doherty. To the former I am indebted for the accompanying plate drawn by Miss O. F. Tassart.

It is probable, from their generally conspicuous and frequently remarkable coloration, that the group as a whole is

unpalatable in a high degree, like the nearest related family, the Coccinellidae, and that an offensive fluid is exuded by many, as is the case with the largest species, *Eumorphus marginatus*, which Mr. Bryant informs me is remarkable for its extraordinarily strong and offensive odour. I suspect it will be found that the characteristic grooves upon the pronotum are the channels into which this secretion is discharged (as Dr. G. A. K. Marshall has found to be the case in the Histeridae), and that the basal foveae when fully developed conceal the orifices of the secretory glands. These depressions, which form one of the best-marked and most constant features of the group, are more or less funnel-shaped and are always deepest just within the basal margin. At the deepest part the appearance of a pore is sometimes visible under the microscope.

Dr. C. J. Gahan, in his account of the stridulating organs of the Coleoptera, has indicated an important group character of this family in the presence or absence of a stridulatory apparatus between the head and pronotum (Trans. Ent. Soc. Lond., 1900, p. 436). He has mentioned that the existence of the organ distinguishes the Eumorphites, Corynomalites and Lycoperdinites of Chapuis, but various genera of the 3rd division must be excluded from this statement, such as *Dapsa*, *Phalantha*, *Sauda*, and *Danae*. This 3rd division, however, is quite an unnatural one, and a more satisfactory arrangement is obtained by adopting Gerstaecker's three Tribes, Eumorphini, Dapsini and Endomychini, and treating the presence of the stridulating organ as the primary distinctive character of the first, instead of the shape of the antennal club, which is a very inconstant and unreliable feature. *Indalmus*, *Ancylopus*, *Lycoperdina*, *Hylaia* (*Ceramis*), *Acinaces*, and *Mycetina*, as well as *Phaeomychus* and other genera of recent date, will then join the Eumorphini. In the more typical genera of that group, with which *Indalmus* and *Ancylopus* should be associated, the 3rd joint of the antenna is much longer than those immediately preceding and succeeding it, whilst in the remainder this great disproportion vanishes. The relative length of these joints is much more reliable than that of the club-joints and serves for the further division of the Eumorphini.

In the ordinary position of the head the microscopically fine stridulatory file, in the genera possessing it, lies beneath the margin of the pronotum and is not visible,

but its presence is invariably indicated by a small membranous lobe placed at the middle of that margin and connected with the scraping edge beneath.

I have followed in the main the order of genera adopted in the most important work upon the family, the admirable monograph by Gerstaecker. The reversed order of Cziki's catalogue has no discoverable advantage.

Four genera introduced into this family by Blackburn may be eliminated altogether, two of them belonging to long-established genera of other families, and the others, although correctly referred to the Endomychidae, being redundant. Of the two former, *Dysceraspliorus laticeps* Blackb., is the cosmopolitan *Coluocera maderae* Woll., and *Eleothreptus punctulatus* Blackb., is a species (the second now known from Australia) of the genus *Aphanocephalus*. *Cranterophorus clavicornis* Blackb., is an *Encymon* exceedingly near the common *E. immaculatus*, but with red femora. Finally *Idiophyes* is a synonym of the genus *Exysma*.

It may be noted here that the Ceylonese "*Lycoperdina*" *glabrata*, of Walker, is a species of the Heteromerous genus *Leiochrodes*.

Genera Haploscelis and Hybopterus.

The name *Cymones* is used in Cziki's catalogue for five Madagascar species which do not include *C. sharpi* Gorh., the insect to which alone the characters assigned to *Cymones* apply and which is a synonym of *Hybopterus plagiicollis* Fairm. *Cymones* is therefore a superfluous name and the five species should be referred to *Haploscelis*, a genus of strangely protean form, distinguished by the prosternum being rather wide between the coxae but not produced beyond them. *Haploscelis helopioides* Gorh., seems to have been based upon two specimens of different species, the female probably belonging to *H. scutatus* Fairm. Fairmaire says of the latter "fémurs antérieurs inermes," evidently meaning the tibiae. These are armed as usual in the male.

There is a peculiar feature in the male of *Hybopterus* which has not been noticed, viz. a delicate hooked filament at the extremity of the hind tibia on the inner side. This is evidently the homologue of the tuft of hairs found in the same position in *Haploscelis atratus* Klug, and other species, and indeed may be composed of long hairs in very close contact.

Genus Trycherus.

Since Gerstaecker's excellent monograph of the Endomychidae, in which five species of *Trycherus* were described, the various additions made have been so inadequately characterised as to introduce ever-increasing confusion which nothing but the comparison of the types can now resolve. The British Museum happily possesses most of these by its acquisition of Mr. Gorham's Endomychidae and those of the great Fry bequest, the former containing types of four of the five species of Gerstaecker and a co-type of *T. longanimis* Thoms. I have therefore been in the fortunate position of having under my eyes the types of all the species of the genus hitherto described, except *T. bifasciatus* Gerst., *raffrayi* Gorh., *josephus* Duv., *elegans* Cziki, and *recticollis* Har. The last species I do not know; *elegans* Cziki, as already noted by Fairmaire, appears to agree in all respects with *longanimis* Thoms., and the other three species I have determined from the descriptions.

There is an excessive external similarity between many of the species of the genus, and the most important distinctive features are the secondary sexual characters. The importance of these was emphasised by Gerstaecker, but all subsequent describers have persistently neglected them.

The distribution of the genus is very interesting. The Catalogue of Cziki, published in 1910, enumerates thirteen species (excluding an Oriental form which certainly belongs elsewhere), all but one (*T. raffrayi*) described from W. Africa. That species also occurs in Angola, as shown by a specimen in the British Museum. One other species (*T. fryanus*) occurs in E. Africa (Rhodesia and Zanzibar), and it is remarkable that that also was described from Angola. Since the allied genera are those of Madagascar and the Malayan region this marked preference for the western side of Africa is striking. Of the thirteen species four have been recently received from Uganda, and no less than seven others are here described from the same region. These may be expected to occur also in W. Africa. Thus, although the species existing are evidently numerous and by no means narrowly localised, the genus seems to have no truly E. African species. The eastern specimens of *T. fryanus* and *T. raffrayi* must be supposed to have straggled there in comparatively recent times. It is certainly curious that in spite of a bold effort to extend eastward, resulting in their

reaching Uganda in such force, the genus should have found there an almost absolute barrier to its further advance. It is also a striking illustration of the fact, confirmed by all my study of Uganda Coleoptera, that the beetle-fauna of that region is almost entirely West African and shows remarkably little connection with that of any other part of Eastern Africa.

All the species of *Trycherus* so far known are included in the following Table—

A. Base of the pronotum not margined.
  B. Elytra elongate.
    C. Extremities of the elytra slightly produced . . . . . *rex*, sp. n.
    c. Extremities of the elytra not produced.
      D. Abdomen tuberculate (♂) or grooved (♀) . . . . . *angolensis* Gorh.
      d. Abdomen without tubercles or groove . . . . . *M-flavus*, sp. n.
  b. Elytra short and ovate.
    E. Extremities of the elytra pale . *ovatus*, sp. n.
    e. „ „ „ dark . *frater*, sp. n.
a. Base of the pronotum margined.
  F. Antennae slender, thoracic margins narrow.
    G. Elytra very convex, short and ovate.
      H. Black, with a pale median bar . *latus*, sp. n.
      h. Pale markings not confined to median bar.
        J. Shoulders dark . . . . . *erotyloides* Gerst.
        j. „ not dark . . . . *bifasciatus* Gerst.
    g. Elytra elongate.
      K. Elytra with pale longitudinal lines.
        L. Pale markings uniting to form a posterior ring . . . . *josephus* Duv.
        l. Pale markings not uniting . . *hydroporoides* Gorh.
      k. Elytra without longitudinal lines.
        M. Elytra with pale apices.
          N. Elytra elongate, not very shining.
            O. Pronotum not pale at the sides . . . . . *appendiculatus* Gerst.
            o. Pronotum pale at the sides.

P. Median bar produced forwards externally . . *longanimis* Thoms.
p. Median bar not produced forwards . . . . *attenuatus*, sp. n.
n. Elytra shining, less elongate.
Q. Small, with bifid apical patch . . . . . *flavipes*, sp. n.
q. Large, with rounded apical patch . . . *nitidus*, sp. n.
m. Elytra with the apices dark.
R. Sides of the pronotum rather straight, elytra shining . *senegalensis* Gerst.
r. Sides of the pronotum not straight, elytra closely punctured.
S. Lower surface dark, with a row of pale spots (♂) *fryanus* Gorh.
s. Lower surface lighter, without pale spots in the ♂ . . . . . *spinipes*, sp. n.
f. Antennae very short, thoracic margins broad.
T. Prothorax broadest at the base . *raffrayi* Gorh.
t. ,, not broadest at the base *tricolor* Gerst.

Trycherus rex, sp. n.

Niger, elytrorum apicibus ferrugineis, singulique linea transversa mediana pallide flava, intus et extus retrorsum ducta et saepe cum macula apicali juncta; elongatus, parum nitidus, vix punctatus, pronoto plano, lateribus laevissime bisinuatis, anguste marginatis, angulis posticis acutis, parum productis, basi haud lato, immarginato, utrinque leviter impresso; elytris convexis, postice paulo nitidioribus lateribus anguste marginatis, antice fere parallelis, humeris prominentibus:

♂, clava antennali lata, apice latiori, tibia antica intus leviter, media profunde, ante apicem excisa, hac supra excisionem acute spinosa, tibia postica valde sinuosa, segmento penultimo ventrali postice bituberculato:

♀, segmento ultimo ventrali medio anguste sulcato.

Long. 12–15 mm.; lat. max. 6–7 mm.

Hab. Uganda: Mabira Forest, Chagwe, 3,500–3,800 ft. (*S. A. Neave*, July), Budongo Forest, Unyoro, 3,400 ft.

(*Neave*, Dec.), Buamba Forest, Semliki Valley, 2,300–2,800 ft. (*Neave*, Nov.).

This large species has a deceptive resemblance to *T. josephus* Duv., which is found in the same localities and of which the pattern is almost the same, although in the new form the recurrent ends of the yellow elytral loop do not always coalesce with the orange apical patch. The best-marked difference is found in the absence of the basal stria of the pronotum, but the elytra are more narrowly margined, parallel-sided and convex, and the antennae in both sexes are broadly truncate at the end, whereas in *T. josephus* they are a little narrowed. The emargination of the front and middle tibiae and the strong spine of the middle tibia, in the male, as well as the median groove upon the last ventral segment of the female are features not found in *T. josephus* and the two tubercles at the posterior margin of the penultimate ventral segment are less widely separated than in that species. In a specimen from S. Nigeria which I regard as the male of *T. angolensis* Gorh., these tubercles are three in number.

Trycherus M-flavus, sp. n.

Niger, tarsis, antennarum extremitatibus segmentoque abdominis ultimo ferrugineis, elytro singulo linea flava ante medium nata et apicem versus utrinque ducta ornato; modice elongatus, postice paulo nitidus, pronoto plano, lateribus anguste marginatis, angulis posticis vix productis, basi haud lato, immarginato, utrinque laevissime impresso; elytris convexis, ovatis, humeris parum prominentibus, apicibus haud productis; clava antennali triangulari, extremitate truncata:

♂, clava antennali paulo latiori, tibiis anticis et intermediis intus anguste excisis, ante et post excisionem minute spinosis.

Long. 12·5 mm.; lat. max. 6 mm.

Hab. Uganda: Entebbe (*C. C. Gowdey*, Feb., April), Mabira Forest (*Gowdey*, July, Sept.).

Two specimens of each sex have been found.

The species has a very close affinity to *T. angolensis* and *T. rex*, but, in addition to the absence of the reddish apical patch upon the elytra, the male is without tubercles at the hinder margin of the penultimate ventral segment and the female has no longitudinal groove upon the terminal segment. The elytra are rather more rounded at the

shoulders than in the other two species and their apices are not produced as in *T. rex*. The club of the antenna is triangular in shape, as in the latter, but much less dilated in the male, and the excision of the front and middle tibiae in the same sex is also different.

Trycherus ovatus, sp. n.

Niger, elytrorum apicibus, abdomine, tarsis antennarumque articulo ultimo ferrugineis, elytrorum fascia mediana transversa pallide flava undulata, ad suturam late interrupta, intus et extus breviter retrorsum ducta; sat brevis, parum nitidus, subtiliter punctatus, pronoto plano, lateribus leviter bisinuatis, anguste marginatis, angulis posticis parum productis, acutis, basi haud lato, immarginato, utrinque leviter impresso; elytris convexis, ovatis, humeris parum prominentibus, lateribus anguste marginatis; clava antennali anguste triangulari, truncata:

♂, clava antennali paulo latiori, tibiis anticis et mediis ante apicem excisis, his supra excisionem acute spinosis.

♀, segmento ventrali ultimo apice minute bifido.

Long. 10–11 mm.; lat. max. 6 mm.

Hab. Uganda: Mabira Forest, Chagwe, 3,500–3,800 ft. (*S. A. Neave, C. C. Gowdey*, July).

It is rather short in form, with the elytra broadly oval and very convex, without prominent shoulders, their apices entirely reddish and a rather narrow zigzag yellow bar crossing each just before the middle. The pronotum is without a basal stria.

The front and middle tibiae of the male are excised before the extremity, the latter more deeply than the former, and the emargination is succeeded by a minute tooth, and in the middle tibia preceded by a strong tooth.

In the female the extremity of the last ventral segment is narrowly notched to a depth of about a quarter of the length.

Trycherus frater, sp. n.

Niger, elytrorum fascia mediana transversa pallide flava aliaque anteapicali antice bilobata, abdomine, tarsis et antennarum articulo ultimo ferrugineis; sat brevis, parum nitidus, subtiliter punctatus, antennarum clava utriusque sexus angustissima, apice truncato: *T. ovato* valde affinis, sed elytrorum apicibus fuscis et feminae segmento ultimo ventrali profundius bifido.

Long. 10–11 mm.; lat. max. 6 mm.

Hab. Uganda: Buamba Forest, Semliki Valley, 2,300–2,800 ft. (*S. A. Neave*, Nov.), Budongo Forest, Unyoro, 3,400 ft. (*Neave*, Dec.), Mabira Forest, Chagwe, 3,500–3,800 ft. (*Neave*, July).

This species entirely resembles *T. ovatus*, but the extremities of the elytra are dark instead of pale and contain a small bilobed reddish spot. The club of the antenna is very narrow and not perceptibly broader in the male than in the female, and the latter has a notch at the apex of the abdomen extending to about the middle of the last segment.

Trycherus latus, sp. n.

Niger, elytrorum ante medium fascia pallide flava undulata, ad suturam late interrupta, abdomine, tarsis antennarumque articulo ultimo ferrugineis; breviter ovatus, convexus, nitidus, distincte punctatus; pronoti lateribus anguste marginatis, basi subtiliter marginato, utrinque leviter impresso; elytris brevibus, lateribus fortiter arcuatis, post humeros sat late marginatis, his prominentibus; antennis gracilibus, clava angusta:

♀, segmento ultimo ventrali integro.

Long. 7–8 mm.; lat. max. 4–4·5 mm.

Hab. Uganda: Semliki Valley, Buamba Forest, 2,300–2,800 ft. (*S. A. Neave*, Nov.).

I have seen only two female specimens.

It is a shining black species, with a transverse pale yellow zigzag bar crossing each elytron before the middle, and the abdomen, tarsi and last joint of the antennae reddish. It is easily recognisable by its broadly oval and convex elytra, much wider than the pronotum, with prominent shoulders and wide reflexed external margins, which are widest just behind the shoulders. The pronotum is broadest at the base, where the angles are slightly produced. Its lateral margins are narrow and the base has a fine and rather inconspicuous marginal stria.

This is the only known species of the genus in which the pattern consists of a single transverse bar only.

Trycherus attenuatus, sp. n.

Niger, corpore subtus, pronoti lateribus, elytrorumque apicibus rufis, fascia posthumerali undulata ad suturam interrupta maculaque utrinque anteapicali flavis; angustus, parum nitidus, subtiliter punctatus; pronoto parvo, lateribus fere parallelis, anguste margin

atis, angulis anticis acutis, posticis rectis, basi marginato; elytris longe ovatis, distincte marginatis, humeris prominentibus:

♂, clava antennali dilatata, tibiis 4 posterioribus apice incurvatis, abdominis segmento ventrali primo medio tuberculato, quarto tuberculis duobus haud approximatis postice armato.

Long. 11 mm.; lat. max. 5·5 mm.

Hab. Uganda: Entebbe (*C. C. Gowdey*, Oct.), Masaka (*Gowdey*, Nov.); Angola (*Dr. Welwitsch*).

This has the closest resemblance to *T. longanimis* and *appendiculatus*, the pale markings being almost identical, except that the antemedian bar is less distinctly produced forwards externally. As in *T. longanimis*, the sides of the pronotum are red. The pronotum is relatively small, with its sides parallel, the front angles sharp and the hind angles right angles, and the base strongly margined. The elytra are not very convex nor very shining, the shoulders are prominent and the lateral margins a little wider than in *T. appendiculatus*. The male has a rather broad club to the antenna, the first ventral segment has a small but sharp tubercle at the middle of its hind margin and the fourth is impressed in the middle and bears two rather widely separated tubercles at the hinder edge.

Trycherus flavipes, sp. n.

Niger, sat nitidus, pronoto, antennarum articulo ultimo, tarsis corporeque subtus laete fulvis, elytrorum fascia posthumerali undulata, ad suturam interrupta, maculaque apicali antice bifida pallide flavis; modice elongatus, pronoto subtiliter punctato, lateribus fere parallelis, anguste marginatis, postice paulo contractis, angulis anticis prominentibus, posticis vix acuminatis, basi marginato; elytris modice convexis, distincte et crebre punctatis, humeris prominentibus:

♂, tibia intermedia apice paulo uncinata, segmento ventrali ultimo haud elongato:

♀, segmento ventrali ultimo elongato, longitudinaliter canaliculato, penultimo late impresso.

Long. 7–8 mm.; lat. max. 4 mm.

Hab. S. Nigeria: Agege.

Several specimens were bred by the late Mr. C. O. Farquharson, in October 1917, from larvae found feeding upon a peculiar filmy lichen on trees inhabited by ants of the genus *Cremastogaster*.

The species is a rather small one, closely resembling *T. erotyloides* Gerst., but smaller, with less ovate and convex elytra. The prothorax, the last joint of the antenna and the tarsi are bright yellow, the median bar and apices of the elytra paler, and the apical patch distinctly bilobed anteriorly.

The male has the middle tibiae slightly incurved at the ends and the last ventral segment rounded behind. In the female the tibiae are nearly straight, the last ventral segment is elongate and rather deeply grooved, and the one preceding it is broadly impressed.

The larva is flattened, with very long hairy processes fringing the body all round and with rather long antennae.

Trycherus nitidus, sp. n.

Niger, elytrorum apicibus lacte rufis fasciaque antemediana undulata, ad suturam interrupta, pallide flava; modice elongatus, nitidus, subtiliter sat crebre punctatus, pronoti lateribus bisinuatis, anguste marginatis, angulis posticis acutis, paulo productis, basi leviter marginato, utrinque minute foveato; elytris paulo convexis, elongatis, humeris prominentibus, lateribus leviter arcuatis, haud late marginatis, apicibus haud productis; antennis gracilibus, clava angusta:

♂, tibia antica ante apicem intus paulo dentata.

Long. 10·5 mm.; lat. max. 5·5 mm.

Hab. Uganda: Entebbe (*C. C. Gowdey*, April), Damba I., Victoria Nyanza (*G. D. H. Carpenter*, Oct.); Gold Coast: Tamsoo, near Tarkwa (*G. A. Higlett*).

There are four specimens in the Museum.

The elytra are a little more convex and shining than those of *T. appendiculatus* and *T. attenuatus*, which this species closely resembles in pattern, and their apices are of a uniform bright yellow colour, with the anterior edge of the patch rounded and not excised as in the species mentioned. The anterior pale mark is exactly as in *T. attenuatus*.

In this species the sexual difference seems to be reduced to its minimum in the genus. The usually well-marked external male characters are absent, and that sex can only be recognised, without dissection, by a very slight tooth towards the end of the front tibia at its inner edge. The thick clothing of hair at that part increases the difficulty of detecting this tooth.

Trycherus spinipes, sp. n.

Niger, pronoto plerumque rufescenti, corporeque subtus, epipleuris, tarsis, antennarum apicibus et elytrorum fasciis duabus transversis undulatis rufis; oblongo-ovatus, parum convexus, supra sat fortiter et crebre punctatus, pronoti lateribus bisinuatis, anguste marginatis, angulis posticis acutis, basi fortiter marginato, utrinque fovea profunda impresso; elytrorum lateribus arcuatis, distincte marginatis, humeris modice prominentibus; antennarum clava utriusque sexus angusta, truncata:

♂, tibia intermedia intus post medium spina valida armata.

Long. 9–10 mm.; lat. max. 5 mm.

Hab. W. Africa: Assini, Lagos (*A. B. S. Powell*, March), Old Calabar (*Andrew Murray*), Bibianaha (*Dr. Spurrell*), Sherbro I.

This is almost identical in appearance with *T. fryanus* Gorh., an East African species of rather wide distribution. It is a little more strongly punctured above, the shoulders are rather less rounded, and the lower surface, with the epipleurae of the elytra, paler in colour. The male is easily distinguished by the absence of the three pale membranous areas at the hind margins of the 2nd, 3rd and 4th ventral segments, and by the very strong spine at the inner edge of the middle tibia.

Brachytrycherus, gen. nov.

Corpus breve, rotundatum. Prosternum modice latum, postice paulo productum, rotundatum. Mesosternum late transversum. Metasternum antice valde marginatum. Pronotum membrana stridulatoria antice instructum, lateribus late explanatum, basi marginatum. Elytra breves, anguste marginati, humeris rotundatis. Pedes graciles, femoribus haud valde clavatis. Antennae parum elongatae, articulo tertio quam secundo duplo longiori, clava angusta, laxe articulata. Palporum labialium articulus ultimus transversus, securiformis, maxillarium fusiformis. Mandibulae apice fissae.

Type, *B. perotteti*, sp. n.

This new genus is necessary for a nondescript Indian insect remarkable amongst the Eumorphini for its short rotund form. It is in some respects a link between the Oriental genera and the Ethiopian *Trycherus* and *Haploscelis*, but its very short, compact shape, and especially the

great breadth of the mesosternum, distinguish it from them all. The prosternum is moderately wide and a little produced behind, where it is very slightly dilated and forms a rounded knob, bearing two small tubercles where it meets the narrowed anterior part of the mesosternum. The latter is very short and broad and the metasternum is margined in front by a deep groove.

I have found no secondary sexual characters in the three specimens known to me. These specimens belong to two species, and one is a badly damaged individual from Guérin's collection, whose name (*perotteti*) I have adopted. This name occurs at the end of the table of genera on p. 581 of the Rev. et Mag. de Zool., in association with that of (*Eucteanus*) *hardwickii* Hope, although the species bears neither resemblance nor relationship to that insect. In describing *Amphisternus verrucosus* and *rudepunctatus*, Gorham has remarked that those species belong to a section of *Amphisternus* "which I believe forms the genus *Haplomorphus* Guérin." That name was clearly intended for a large part of the genus *Eumorphus* as at present constituted, and Gorham's remark is meaningless. I have not seen the former species, but *rudepunctatus* may be regarded as a rather aberrant member of the new genus *Brachytrycherus*. It is possible that instead of *Haplomorphus* Gorham intended to write *Homalosternus*, the genus to which Guérin tentatively and quite erroneously referred his (undescribed) specimen of *B. perotteti*, which was formerly in Gorham's collection with that name in Guérin's handwriting.

Brachytrycherus perotteti, sp. n.

Niger, nitidus, utroque elytro plagis duabus rubris undulatis transverse notato; late ovatus, convexus, pronoto irregulariter sat fortiter punctato, medio convexo, lateribus late explanatis, anguste marginatis, marginibus antice valde arcuatis, angulis prominentibus, postice fere parallelis, rectis, angulis paulo productis, acutis, basi stria profunda marginato, foveis basalibus profundis, cum angulis posticis connexis; elytris undique punctatis, lateribus fortiter arcuatis, anguste marginatis; antennis parum gracilibus, articulo tertio quam quarto dimidio longiori, tribus ultimis laxe articulatis, angustis.

Long. 6–7 mm.; lat. max. 4–4·5 mm.

Hab. S. India: Nilgiri Hills (*Perottet, A. K. Weld Downing*).

Smooth and shining above, the elytra each ornamented with two deep blood-red marks of very irregular shape, the first behind the shoulder and remote from the suture, the second before the apex, approaching both the inner and outer margins and having its widest part parallel to the suture. The convex median part of the pronotum has a well-marked longitudinal groove posteriorly and the hind angles are acutely produced, the apices fitting, in the position of rest, into minute sockets in the shoulders of the elytra.

Brachytrycherus madurensis, sp. n.

Niger, vix nitidus, elytris nigroaeneis, utroque fascia posthumerali angusta undulata, intus ad basin producta, aliaque postmediana pluriangulata, rubris signato; late ovatus, convexus, supra undique sat crebre et fortiter punctatus; pronoto lato, plano, medio leviter convexo, marginibus antice valde arcuatis, angulis prominentibus, obtusis, postice rectis, fere parallelis, angulis vix productis, fere rectis.

Long. 7 mm.; lat. max. 4·5 mm.

Hab. S. India: Madura, Shembaganur.

A single specimen received from the late M. Antoine Grouvelle, has been presented by Mr. H. E. Andrewes to the British Museum.

This species closely resembles *B. perotteti*, but is less smooth and shining, on account of the strong and rather close puncturation of the upper surface. The pronotum is less convex in the middle, the longitudinal groove upon its posterior part is inconspicuous, and the hind angles are scarcely produced or acute. The elytra have a very faint coppery tinge and the red markings are narrow and zigzagged, the anterior one produced forwards close to the suture as a loop which almost touches the basal margin, the posterior one approaching but not reaching the inner and outer margins.

Genus Amphisternus.

Gorham mentions nothing by which his *Amphisternus papulatus* can be distinguished from *A. bellicosus* Gerst., also from Sumatra, which he appears to have overlooked. I believe this to be a wide-ranging species with many local races.

The following is an exceedingly well-marked species.

Amphisternus phyllocerus, sp. n.

Niger, nitidus, elytris purpureis, singulo maculis duabus magnis transversis elevatis pallide flavis ornato; modice elongatus, postice haud attenuatus, pronoto transverso, quam elytris multo angustiori, angulis anticis productis incrassatis, posticis rectangulis, lateribus fere rectis et parallelis, dorso medio profunde biimpresso; elytris leviter punctatis, plagis duabus pallide flavis elevatis laevibus, humeris modice prominentibus, lateribus paulo deplanatis, fere parallelis; antennis tenuissimis, clava latissima, femoribus valde clavatis:

♂, tibiis anticis usque ad medium fere rectis, deinde arcuatis.

Long. 7·5 mm.; lat. max. 4·5 mm.

Hab. Assam: Patkai Hills (*W. Doherty*).

I have seen only a single male specimen.

This is an entirely peculiar species, resembling *Eucteanus marseuli* more than any known *Amphisternus*, of which genus it is nevertheless only a curiously modified representative. The antennae are very slender, with a very broad and flat club, of which the first joint is almost an equilateral triangle and the other two conjointly about as broad as long. The pronotum is as usual rather small, with very prominent but blunt front angles. The elytra are almost parallel-sided and not long, with a transversely oval pale yellow patch behind the shoulders, forming an abrupt rounded swelling, and another similar one before the apex. The legs are slender, the tibiae clothed with short golden hairs, and the front tibiae of the male regularly curved in the anterior half.

Genus Engonius.

Engonius tetrasphaera, sp. n.

Niger, elytris plerumque coeruleo-nigris, singulo bimaculato, maculis magnis, rotundatis; convexus, parum elongatus, pronoto valde transverso, ante medium paulo dilatato, angulis anticis productis, posticis acutis; elytris cordiformibus, sat fortiter punctatis, lateribus valde arcuatis, ante medium sat latis:

♂, tibiis 4 anterioribus intus similiter acute spinosis, abdominis apice subtus excavato.

Long. 7 mm.; lat. max. 4 mm.

Hab. Borneo: Sandakan (*C. F. Baker*), Pengaron

(*Doherty*), Banjermassin; Malay Peninsula: Perak (*Doherty*).

The British Museum contains two specimens of each sex, all of them found in different localities.

The species is nearly allied to *E. klugi* Gerst., and is found in the same localities. It is smaller, shorter and more convex. The pronotum is more transverse, broader before the middle, with more prominent front angles, and the elytra are more cordiform, *i. e.* they are shorter, relatively broader before the middle and more rapidly narrowed behind. The coloration is similar but the four elytral spots are almost exactly round in outline and of equal size.

The male has an acute spine on each of the four anterior tibiae, all equally developed, whereas in *E. klugi* that of the fore-leg is much stronger than that of the middle one. The apex of the abdomen is hollowed beneath and not broadly emarginate as in *E. klugi*.

Genus Eumorphus.

All the known species of this genus, except *E. insignis* and *opalinus* of Gorham and *E. quadripustulatus* Friv., are represented in the Museum. It is essentially Malayan, the limits of its range being apparently Celebes and Assam, and the occurrence of *E. pulchripes* in Ceylon is a remarkable fact not at present to be explained. Many more Malayan forms might be described.

With the single exception of *E. bipunctatus* Perty, every known species of this large genus is decorated with four yellow spots upon the elytra.

The type of *Pedanus laevis* Gorh., is a small specimen of the very common *E. 4-guttatus* Illig.

E. 4-verrucosus Guér., according to the type in the British Museum, is *E. coloratus* Gerst., and not *E. carinatus* as stated in Cziki's recent catalogue.

E. dehaani Guér., is not synonymous with *E. tetraspilotus* Hope.

E. assamensis Gerst., appears to be a variety of *E. subguttatus* with larger spots.

E. sanguinipes Guér. The original type of this, now in the British Museum, was re-described in error by Gorham, who supposed it to have come from Java, a mis-reading of "Tan" in Hope's writing on the label, which is actually an abbreviation of "Tanasserim." The specimens from

Burma which Gorham attributed to *E. murrayi* no doubt belong to *E. sanguinipes*. His type of the former is a more slenderly-built insect, with clavate femora and distinctly curved hind tibiae in the male. There is no reason to doubt its Philippine origin. Another form described by Gorham with an unknown habitat, *E. expatriatus*, is also from the Philippine Is., and is merely the female of *E. thomsoni* Guér., a much less smooth and shining species than *E. cyanescens* Gerst., of which it stands as a synonym in Cziki's catalogue, while *E. thomsoni* Gorh., although described from the same specimen, is treated as a different species.

The following is yet another Philippine species.

Eumorphus productus, sp. n.

Coeruleo-niger, nitidus, singulo elytro maculis duabus palliđe flavis fere rotundis ornato : anguste ovalis, elytris prope scutellum minute tuberculatis, extus late marginatis, margine postice latissimo, apicibus divergentibus, rotundatis :

♂, tibia antica intus medio valde spinoso, posterioribus 4 intus subtiliter ciliatis, media leviter arcuata.

Long. 15 mm.; lat. max. 8 mm.

Hab. Philippine Is.

Two male specimens were taken by H. Cuming.

This is closely related to *E. cyanescens*, of which it has the size, pattern and glossy surface. The anterior elytral spot is a little farther from the shoulder and the lateral flange of the elytron, although of the same width at the side, is considerably more produced behind, with the extremities rounded and divergent. There is a tubercle at the base of each elytron near the scutellum, in place of the carina which in *E. cyanescens* runs parallel to the suture for about a quarter of the length of the latter. The posterior angles of the pronotum are also a little more produced and curved.

Eumorphus felix, sp. n.

Niger, elytris nigro-violaceis, singulo maculis magnis duabus flavis subrotundatis ornato, macula antica paulo pone humerem posita; elytris ovatis, margine externa antice modice, postice valde dilatata; antennarum clava lata :

♂, dorso nitido, prothoracis angulis posticis extus valde productis et acuminatis, elytris convexis; tibia antica intus medio dente valido fere erecto armata, intermedia valde arcuata, postica arcuata et intus dense ciliata :

♀, dorso opaco, prothoracis angulis posticis vix productis, elytris haud convexis, costa discoidali, alia basali brevi margineque suturali elevatis.

Long. 15 mm.; lat. max. 9 mm.

Hab. Brit. N. Borneo : Kina Balu (*Whitehead*), Kiou (*R. Hanitsch*).

The Museum possesses one specimen of each sex.

This is closely related to *E. quadrinotatus* Gerst. and *E. insignis* Gorh., but differs from both in having the anterior yellow patch of the elytron placed at a distance from the front margin and not including the humeral callus. The flattened margins are a little less wide in the anterior part than in the former, the hind angles of the thorax are much more produced and acute in the male, and the front tibia in that sex has the tooth stouter, placed nearer the middle and less oblique. The club of the antenna is rather shorter and broader in both sexes.

In the female the short discoidal carina at the base of each elytron is very distinctive.

Eumorphus macrospilotus, sp. n.

Niger, nitidus, elytris nigroviolaceis, singulo maculis duabus magnis flavis approximatis ornato; regulariter sat longe ovalis, prothoracis angulis posticis ad elytrorum humeros exacte coadaptatis, acuminatis, foveis basalibus brevissimis et vagis; elytrorum marginibus externis deplanatis sed haud latis, dorso leviter convexo :

♂, tibia antica intus dente valido medio posito, extus lamina curvata armata, tibiis intermediis et posticis regulariter arcuatis, prothoracis angulis posticis longe productis et curvatis.

Long. 11·5 mm.; lat. max. 6 mm.

Hab. Brit. N. Borneo : Kina Balu (*Whitehead*), Kiou (*R. Hanitsch*).

There are four specimens, all males, in the British Museum collection and a female in the Cambridge University Museum.

It is a species related to *E. guerini* and *E. fryanus*, but of a rather narrow and regularly oval shape, with the

elytral margins well-marked but not wide and the curvature of the sides of the prothorax and elytra continuous. The yellow dorsal patches are very large, as in *E. felix*, the anterior and posterior ones separated by an interval less than the diameter of either, and also less than the interval separating the former from the basal margin. The front tibia of the male has a carina upon its outer edge, as in *E. fryanus* (but rather less angulated than in that species), and the internal tooth is very strong and arises in the middle. The curvature of the middle and hind tibiae in the same sex is regular and not abrupt. The posterior angles of the prothorax are acute in both sexes and very long in the male, and the extremities of the elytra are produced in the female.

Eumorphus festivus, sp. n.

Niger, nitidus, elytris nigroviolaceis, singulo maculis magnis duabus ornato, maculis subrotundatis flavis, antica paulo pone humerem posita; ovalis, elytrorum dimidio externo opaco, margine sat late explanato, postice haud producto:

♂, prothoracis angulis posticis extus valde productis et curvatis, tibia antica extus medio valde angulata, intus fortiter spinosa, intermedia post medium geniculata, postica arcuata et intus dense ciliata, segmento ventrali ultimo postice exciso, medio minute dentato.

Long. 12–13 mm.; lat. max. 7–8 mm.

Hab. Borneo: Sarawak (*R. Shelford*).

This is another species closely related to, and intermediate between, *E. fryanus* and *E. macrospilotus*. It is of the same size as the former, and has the margins of the elytra similarly dilated in the corresponding sex. The elytra are a little shorter relatively, with their margins not wider at the tips than at the sides. The yellow spots are a little larger than those of *E. fryanus*, and larger absolutely than those of *E. macrospilotus*, but the latter being a rather smaller insect, the intervals between them are greater. The anterior spots are also placed nearer the base than in the latter insect. The hind angles of the prothorax and the tibiae of the male are as in *E. fryanus*, but the last dorsal segment in that sex is less conspicuously bifid at the extremity.

Eumorphus helaeus, sp. n.

Brunneo-niger, nitidus, singulo elytro bimaculato, maculis sat parvis, flavis, rotundatis, anteriori ad humeros haud attingenti; prothorace lato, lateribus valde bisinuatis, angulis posticis acutis; elytris convexis, laevibus, haud costatis aut perspicue punctatis, marginibus latissimis, apicibus acutis, haud productis; tibiis 4 posterioribus arcuatis:

♂, prothorace basi latissimo, angulis posticis acute productis et curvatis; elytris conjunctim circularibus; tibia antica ante apicem fortiter spinosa et emarginata, posterioribus 4 valde arcuatis et intus dense hirsutis.

Long. 16 mm.; lat. max. 11·5 mm.

Hab. Sumatra: Merang (*Doherty*).

This very distinct species is related to *E. turritus* Gerst., to which it is similar in size and coloration, but the ground-colour is rather darker and scarcely at all metallic. The elytral margins are even wider than in that species and a little more curved upwards, the discoidal part is regularly convex, without median elevation or lateral costae, and the yellow spots are less raised. In the male the tibiae are stouter and their inner edge (in the front tibiae as well as the rest) is closely fringed with rather long hairs. The spine upon the front tibia is stout, clothed with hair, placed nearer the extremity than in *E. turritus*, and followed by a deep abrupt excision.

Two males and three females were taken by Doherty.

Eumorphus fraternus, sp. n.

E. helaeo valde affinis sed paulo magis attenuatus, elytrorum marginibus postice productis, apicibus acuminatis, contiguis:

♂, elytris conjunctim ovalibus, lateraliter paulo minus latis, tibiis omnibus ciliatis, antica torta atque fortiter spinosa.

Long. 13–14·5 mm.; lat. max. 7–9 mm.

Hab. Malay Peninsula: Perak (*Doherty*).

Six specimens were contained, like those of the three preceding species, in the Fry Collection.

E. fraternus closely resembles *E. helaeus*, but the elytral margin is a little narrower at the side and a little wider at the apex, with the extreme angles acutely produced and convergent. The front tibia of the male is a little less pubescent at the inner edge and the apical excision

rather less narrow and deep. There is also a close affinity with *E. politus* Gerst., but *E. fraternus* is a larger species with wider margins to the elytra, of which the apical angles are very sharp and convergent. The hind angles of the prothorax are less produced in the male, the front tibiae are not deeply grooved externally, as in that species, and the last ventral segment is not acutely notched in the middle.

Genus Stictomela.

This genus seems to be peculiar to Ceylon and its species have hitherto been found only by Mr. George Lewis. A third representative is "*Spathomeles*" *inflatus* Gorh., which has the characteristic heavy build, narrow loosely-jointed antennal club and tumid shoulders of the other two.

Genus Amphix.

The types of Bates' monograph of this genus are in the British Museum. *A. gerstaeckeri* is not, as supposed by Cziki, a form of *A. vestitus* Panz., nor are *circumcinctus* and *robustus* of Bates varieties of *A. discoideus* F.

Genus Indalmus.

The distribution of species between the two genera *Ancylopus* and *Indalmus* is quite unnatural. It seems to have been decided entirely by the appearance presented by the front coxae, which are said to be contiguous in *Ancylopus* and separated in *Indalmus*. In reality there is always a thin lamina between the coxae and this differs to a slight extent in its breadth, but the variation is so small that, in the absence of any other and sharper distinctive character there seems no reason to make an arbitrary break in the series of stages which connect the two extremes. The mesosternum exhibits a variety of forms which are much more marked than those of the prosternum, but have no relation at all to the present grouping of the species. The typical species of *Ancylopus* (*A. melanocephalus* Oliv., of which *A. bisignatus* Gerst., is probably a colour-variety) quite obviously stands apart from the rest, which cannot at present be easily separated, although it may perhaps be found desirable in the future to devise additional genera. I therefore transfer to

Indalmus the other forms at present placed in *Ancylopus*. *A. melanocephalus* has in the female a very remarkable transverse sulcus upon the pronotum and an oblique impression upon each elytron of which no trace is found in any other described species. In the male a small but important distinctive character which seems not to have been noticed exists in the antennae, the eighth joint of which is narrower than either of those adjoining it.

Indalmus bivittatus Perch. (or the species to which it is agreed to apply that name) appears to inhabit a very large part of Africa. It is very variable in coloration and has been many times described, the names *unicolor* Gerst., *fuscipennis* Gahan, and *nigrofuscus* Gorh., being synonyms of it.

Fairmaire has described (Ann. Soc. Ent. Belg. 1897, p. 203) as *Indalmus bivittatus* a species from Madagascar which is evidently distinct and which is omitted from the Catalogue. To avoid confusion this may be re-named

Indalmus hova, nom. nov.

Indalmus clavipes, sp. n.

Fusco-castaneus, nitidus, elytris purpureo- vel cupreo-fuscis, singulo flavo-bimaculato, maculis transversis, paulo irregularibus, haud magnis; pronoto haud valde transverso, glabro, convexo, lateribus antice fortiter arcuatis, angulis prominentibus, postice fere rectis, angulis acutis, haud productis, sulcis basalibus profundis, fere ad medium attingentibus; elytris ovatis, sat brevibus, subtiliter punctulatis, lateribus undique aequaliter arcuatis, distincte marginatis; antennis gracilibus, articulis omnibus elongatis, tribus ultimis clavam angustam laxam, intus serratam formantibus, ultimo recte truncato:

♂, tibia antica intus apicem versus gradatim dilatata, clavata, apice paulo emarginato, intermedia apice intus incurvata, minute uncinata, posticae dimidio postico intus sat longe fulvo-hirto.

Long. 6 mm.; lat. max. 3 mm.

Hab. S. India: Nilgiri Hills, Karkur Ghat, 2,000 ft. (*H. E. Andrewes*, July).

A good series of this isolated species was taken by Mr. Andrewes. It is easily recognisable by its glossy surface, short, ovate and rather metallic elytra with distinctly flattened margins, long slender antennae, terminating in a narrow loosely-jointed club of three sharply triangular joints, and by the peculiar structure of the tibiae in the

males. The front tibia is without the usual sharp spine, which is replaced by a gradual thickening towards, but not quite extending to, the extremity, the middle tibia is incurved at the end, where it bears a minute hooked process internally, and the hind tibia is sinuous and furnished with a conspicuous fringe of yellow hair upon the posterior half of its inner edge.

LYCOPERDINELLA, gen. nov.

Corpus modice elongatum, convexum, toto sericeum. Pronotum transversum, postice paulo contractum, antice membrana stridulatoria instructum. Prosternum et mesosternum haud producti aut elevati. Coxae anticae contiguae. Femora omnia clavati. Antennarum articulus 2 nonnihil elongatus, 4 paulo brevior, 3 quam 4 duplo longior, 5 ad 9 similes, moniliformes, 10 et 11 transversi, connati. Palpi omnes acuminati. Oculi magni, grosse granulati.

♂, femoris postici margo posterior medio prominens, spinis 4 vel 5 minutis equidistantibus armata tibiaque postica arcuata, intus ante apicem spina acuta instructa.

Lycoperdinella morosa, sp. n.

Fusco-rufa, undique grisco-pubescens, tarsis clavaque antennali flavidis; convexa, supra crebre et fortiter aequaliter punctata, pronoto brevi, medio convexo, subtiliter longitudinaliter sulcato, lateribus subparallelis, leviter bisinuatis, angulis anticis prominentibus, haud acutis, posticis brevissime acuminatis, foveis basalibus profundis, post medium productis, sulco basali recto, ad marginem valde approximato; elytris sat elongatis, fortiter haud seriatim punctatis, valde convexis, humeris prominentibus, lateribus deinde dilatatibus, pedibus modice robustis.

Long. 4 mm.; lat. max. 2 mm.

Hab. RHODESIA: Salisbury (*G. A. K. Marshall*, April), Namaila (*H. Dollman*, September).

The Museum Collection contains a pair from each of the localities above named.

It is an interesting form, intermediate between *Indalmus* and *Lycoperdina*, different as the typical forms of those genera are. In outline it is transitional between the oblong shape of the former and the short tapering *Lycoperdina* type. The pronotum is strongly transverse but distinctly narrows behind. The antennal club is two-jointed, the last two joints being connate and slightly

transverse and the 9th joint not distinctly larger than the 8th. The 2nd joint is slightly elongate, the 4th a little shorter than the 2nd (as in *Lycoperdina*) and the 3rd about twice as long as the 4th.

In size, colour and general appearance there is a strong resemblance to *Lycoperdina sericea*, but the colour is generally more uniformly reddish (in one specimen the median dorsal part is nearly black). The tarsi and the club of the antenna alone are pale. The pronotum is shorter and the elytra are longer than in *Lycoperdina*, and the latter are rather parallel-sided, not perceptibly dilating behind the shoulders. The entire upper surface is closely and rather strongly punctured and clothed with decumbent grey hairs.

The curved hind tibia of the male bears a minute spine just before the extremity, and the hind femur in that sex is provided with a comb-like series of still more minute teeth unlike anything else known in the family.

Genus Dryadites.

Mycetina erubescens Gorh., is a species of *Dryadites*, a genus very different from *Mycetina*. There is nothing in the description by which the insect can be distinguished from *D. borneensis* Friv.

The following species also belong to the genus.

Dryadites latipennis, sp. n.

Niger, nitidus, pronoto rubro, linea mediana nigra, elytrisque rufis, nigrocinctis, margine nigro antice et postice paulo latiori; late ovatus, prothorace lato, lateribus regulariter arcuatis, angulis anticis sat remotis; elytris brevibus, conjunctim vix longioribus quam latioribus, fere circularibus, lateribus late explanatis, fortiter arcuatis; antennis sat gracilibus, clava minuta, articulo 9° triangulari, haud lato, 10° et 11° brevissimis, connatis, 11° quam 10° multo angustiori.

Long. 5 mm.; lat. max. 4 mm.

Hab. W. Sarawak: Mt. Matang, 2,000 ft. (*G. E. Bryant*, Jan., Feb.).

This is closely similar to *D. borneensis* Friv., which Mr. Bryant also rediscovered in its original habitat, Mt. Matang, but the red patches cover the greater part of the surface of the elytra, whose outline they follow instead of being

pointed behind as in *D. bornecnsis*. The insect is much broader and more hemispherical, and the elytra have rather wide flattened margins. The club of the antenna is much smaller, its first and last joints being much narrower than the middle one, the first triangular and the other two very short and closely articulated.

Dryadites purpureus, sp. n.

Niger, elytris purpureis, pronoti lateribus elytrorumque macula subrotunda post medium posita sanguineis; ovalis, convexus, nitidus, pronoto parum lato, lateribus haud regulariter arcuatis, marginibus haud excavatis, angulis anticis vix productis aut acutis; elytris sat latis, lateribus modice explanatis; antennis haud longis, clava oblonga, sat angusta, articulis connatis.

Long. 5 mm.; lat. max. 3·5 mm.

Hab. W. Sarawak, Borneo: Quop (*G. E. Bryant*, March).

Only a single specimen was found.

The elytra are of a deep purple colour, and each has a deep blood-red patch behind the middle. The pronotum is relatively narrower than in *D. bornensis* and *D. latipennis*, its sides are not hollowed as in those species nor its lateral margins evenly rounded, and the front angles are blunter. The antennae are rather shorter, the club narrow, closely articulated and parallel-sided and the third joint relatively less elongate.

Genus Mycetina.

Mycetina candens Gorh., is obviously synonymous with *M. castanea* Gerst. Although he has omitted to mention the fact, Gorham's type is a male, of which sex Gerstaecker carefully detailed the well-marked characteristics, making the former's error more surprising.

There appears to be a tendency in this genus, contrary to that generally observed in beetles, for the male to be of slightly larger size than the female.

It is difficult to understand why *Lycoperdina testacea* Ziegl., was placed by Leconte and Gerstaecker in this genus, from which it differs widely, as its very loosely-jointed antennal club indicates. The absence of a stridulatory flange to the pronotum excludes it from the present group, and I refer it to the genus *Dapae*.

Mycetina tetrasticta, sp. n.

Nigra, nitida, corpore subtus fusco-rufo, elytris utrinque macula pallide flava paulo ponc humerum vix ad marginem lateralem attingenti aliaque minori transversa ante apicem ornatis; oblongo-ovata, sat lata, parum convexa; prothoracis disco subtiliter paree punctato, lateribus sat grosse et crebre punctatis et minute setosis, marginibus antice rotundatis, postice rectis et parallelis, basi profunde sulcato; elytris brevibus, distincte punctatis, marginibus externis paulo deplanatis, apicibus rotundatis; antennis haud longis, articulis 1, 3, 4 et 5 paulo elongatis, tribus ultimis transversis, clavam bene definitam formantibus, articulo ultimo brevissimo.

Long. 4 mm.; lat. max. 2·5 mm.

Hab. Assam: Patkai Hills (*W. Doherty*).

There are two specimens, probably females, in the British Museum.

The species shows a nearer relationship to the European and North American forms than to any other yet known from the Oriental region. It has the characteristic four spots upon the elytra, but these are of a very pale yellow colour and the whole remaining upper surface is black, slightly tinged with red upon the head and the front angles of the pronotum. It is rather broad in form, with the sides of the pronotum roughly punctured, the margins straight and parallel behind, the elytra rather strongly punctured, their outer edges a little flattened, their apices rounded and not angulate and the antennae compact, with a well-defined, rather oblong club.

Mycetina corallina, sp. n. (Plate I, fig. 8.)

Lacte rufa, antennis nigris, articulo basali flavo excepto, valde nitida, dorso minutissime et parcissime, capite, pronoti lateribus, pedibus corporeque subtus densius albo-setosis; elongata, convexa, pronoto haud lato, lateribus antice leviter arcuatis, postice rectis, paulo contractis, basi profunde sulcato, foveis lateralibus fere ad medium attingentibus, elytris basi sat angustis, post medium ampliatis, minute sed distincte punctatis; antennis longis sed haud laxe articulatis, articulo tertio elongato, deinde ad apicem gradatim dilatatis, clava indefinita, articulo ultimo rhomboidali, vix elongato.

Long. 4 mm.; lat. max. 2·5 mm.

Hab. Malay Peninsula: Penang (*G. E. Bryant*, Oct.

and Nov.), Singapore, Bukit Timah (*Bryant*, May); Borneo, Sarawak: Lundu (*Bryant*, Jan.).

A considerable series was found by Mr. Bryant at Penang, where the species was also taken by Lamb many years ago.

The shape is peculiar. Excluding *M. testacea*, which does not belong to the genus, it is the most elongate species known to me. Its widest part is considerably behind the middle of the elytra and the pronotum at its widest part is narrower than the elytra at the shoulders. It is very smooth and shining above, except at the sides of the pronotum, which are rugulose and thinly clothed with very minute grey setae, the entire upper surface bearing similar but scattered and extremely minute setae, and the head, legs and lower surface rather closely clothed with very short hair. The antennae are rather long but closely articulated and widening gradually from the third joint, the three joints forming the club being little differentiated from the rest.

The female is almost similar to the male, but the antennae are a little shorter and all the tibiae rather more slender.

Mycetina lurida, sp. n. (Plate I, fig. 7.)

Castanea, elytris leviter rufescentibus, pronoti lateribus elytrorumque humeris pallidioribus, antennis nigris, articulis tribus basalibus et ultimo rufis; convexa, parum elongata, pronoto haud lato, lateribus valde bisinuatis, angulis posticis divergentibus, foveis basalibus profundis, ad pronoti medium attingentibus; elytris late ovalibus, lateribus explanatis, recurvatis; antennis gracilibus, clava 3-articulata, haud lata:

♂, pedibus longis et validis, antennisque gracilioribus, abdominis subtus segmento 5° valde transversim eristato.

Long. 3·5–4 mm.; lat. max. 2·5–3 mm.

Hab. Borneo, W. Sarawak: Mt. Matang (*G. E. Bryant*, Dec., Feb.).

Mr. Bryant found one specimen of each sex.

This species is very similar to *M. brevicollis* Gorh., and identical in coloration, except that three, instead of only two, basal joints of the antenna are red. Those organs, however, are not stout and compact, but slender and loosely-jointed, with a club composed of three joints only. The sides of the prothorax are strongly rounded in front and

gently sinuated behind, with the hind angles a little divergent. The lateral foveae are deep and fully half as long as the prothorax. The elytra have broad recurved lateral margins.

M. lurida is chiefly notable for its strongly-marked male features. The legs in that sex are very long and stout, the middle and hind femora thickened and a little curved, the antennae loosely-jointed and slender, and the fifth ventral segment bears a strongly elevated transverse crest or carina, produced at each end and curved inwards and backwards.

Mycetina globosa, sp. n. (Plate I, fig. 9.)

Testacea, corpore supra laete purpurascenti, pronoti lateribus elytrorumque humeris pallidioribus, antennis nigris, articulis tribus basalibus et ultimo rufis; brevis, globosa, pronoti lateribus antice arcuatis, postice rectis, parallelis, foveis lateralibus brevibus, ad medium haud attingentibus; elytris convexissimis, bene punctatis, humeris prominentibus, lateribus anguste marginatis; antennis haud gracilibus, clava triarticulata, compacta, sat lata.

Long. 3·5 mm.; lat. max. 2·5 mm.

Hab. W. Sarawak, Borneo: Mt. Matang (*G. E. Bryant*, Dec., Jan.).

This little species is easily recognisable by its very short, globular shape and the beautiful metallic purple colour of the upper surface. The coloration is similar to that of *M. lurida*, but the purple hue is much more intense, and the antennae, although coloured in the same way, with the terminal joint pale, are much shorter and more compact.

Mycetina soror, sp. n.

Flavo-rufa, nitida, elytris saturate cyaneis, metallicis, sat fortiter et crebre punctatis, singulo pustula flava rotundata ante medium ornato; *M. doriae* similissima, sed elytris cyaneis, profunde sat crebre punctatis, antennisque paulo latioribus.

Long. 3·5–4·5 mm.; lat. max. 2·5–3 mm.

Hab. Malay Peninsula: Penang.

A female specimen in the British Museum was taken by Lamb many years ago, and a second was found by Mr. Bryant in October 1913.

The species is exceedingly like *M. doriae* Gorh., from which it differs by its deep blue elytra, which are also more strongly and closely punctured, and its rather broader antennae.

The male of *M. doriae*, of which both sexes were also found by Mr. Bryant at Mt. Matang, Sarawak, has an excision of the inner edge of the middle tibia just before the end, as well as that of the front tibia mentioned by Gorham.

Mycetina pulchella, sp. n.

Flavo-rufa, pedibus antennarumque articulis duobus basalibus inclusis, harum reliquis nigris, elytris violaceis; lata, nitida, pronoto brevi, lateribus antice fortiter arcuatis, postice rectis, fere parallelis; elytris parum elongatis, valde convexis, minute sat fortiter punctatis; tibiis paulo clavatis, basaliter leviter arcuatis, antennis sat robustis, articulis 3°–5° paulo elongatis, 10° et 11° latis, transversis: ♂, antennis gracilioribus, tibiis posticis longioribus, intus a medio subito dilatatis, elytris extus paulo explanatis.

Long. 3·5–4·5 mm.; lat. max. 2·5–3 mm.

Hab. Malay Peninsula: Penang (*Lamb*), Perak (*Doherty*).

Bright orange-red, with the elytra violet (sometimes vaguely orange-tinged at the extreme apex) and the antennae black, except the two basal joints. It is broadly oval in shape, with the pronotum shorter than in *M. doriae* and *M. soror* and not perceptibly contracted behind, and the elytra short but not hemispherical as in *M. cyanipennis*. The antennae are rather less compact than in those species. In the male the antennae are less robust, the hind tibiae are distorted, and the elytra are more distinctly margined laterally.

Mycetina luzonica, sp. n.

Fusco-castanea, humeris pronotique lateribus vix pallidioribus, antennis nigris, articulis tribus basalibus apiceque extremo rufescentibus; late ovata, compacta, convexa, nitida, pronoto brevi, lato, vix perspicue punctato, lateribus antice leviter arcuatis, angulis haud acutis, postice rectis, parallelis, angulis quadratis, sulco basali ad marginem posticam valde approximato, foveis basalibus haud ad medium attingentibus; elytris brevibus, minute punctatis,

humeris prominentibus, lateribus paulo explanatis; antennis compactis, articulis tribus ultimis latis, transversis, apice truncato.

Long. 3·5–4 mm.; lat. max. 2·5 mm.

Hab. Philippine Is., Luzon: Mt. Makiling (*C. F. Baker*).

This is a very rotund and compactly-formed species of a nearly uniform reddish-brown colour, but with the last 8 joints of the antennae black, except the extreme apex. The antennae are very broad and closely jointed, with the last three joints strongly transverse. It is rather more rotund than *M. brevicollis* Gorh., and almost as much so as *M. globosa* Arr., to which it has perhaps the closest resemblance. The puncturation is finer than in either of those, and the colour is almost uniformly brown, with no trace of metallic lustre (in the dead specimens at least). The joints of the antennae also are rather shorter and closer and the terminal one is only pale at its extremity.

Mycetina felix, sp. n.

Lacte flavo-rufa, pedibus antennarumque articulis duobus basalibus inclusis, harum reliquis nigris, elytris violaceis, apicibus flavis; breviter ovata, nitida, pronoto brevi, lateribus antice fortiter arcuatis, postice rectis, parallelis; elytris minute sat fortiter punctatis, brevibus, valde convexis; pedibus antennisque sat longis.

Long. 3·5–4·5 mm.; lat. max. 2·5–3 mm.

Hab. Java.

Three specimens in the British Museum originally formed part of the Bowring Collection.

The species closely resembles *M. pulchella*, the size, shape and coloration being the same, except that the apices of the elytra have a sharply-limited yellow patch. The male has the legs quite simple but stouter than those of the female. As in *Mycetina pulchella*, it is larger than the female, relatively a little more elongate, with wider margins to the elytra and more dilated antennae, of which all three club-joints, as well as the two joints preceding them, are distinctly transverse. In the female only the last two are distinctly transverse, the fifth to the ninth being about as long as they are broad.

Mycetina cyanipennis, sp. n.

Lacte flavo-rufa, pedibus antennarumque articulis duobus basalibus inclusis, illarum reliquis nigris, elytris cyaneis, metallicis;

nitida, brevis, pronoto lato, lateribus antice leviter arcuatis, postice rectis, fere parallelis; elytris subglobosis, valde convexis, minute sed fortiter punctatis; tibiis omnibus paulo clavatis, basaliter leviter arcuatis; antennis robustis, articulis 3°–5° paulo elongatis, duobus ultimis latis, transversis.

Long. 3–4 mm.; lat. max. 2·5–2·75 mm.

Hab. Malay Peninsula: Perak (*Doherty*), Penang (Oct. and Nov., *G. E. Bryant*).

This little insect is shorter and more globular than any other species of the genus known to me. It closely resembles *M. pulchella*, but the elytra are more hemispherical in shape and blue instead of violet in colour, with narrowly reflexed margins. The legs are moderately slender and the tibiae narrow and a little curved in the anterior half, broader towards the end. The antennae are stout and compact, gradually dilating towards the club, which is broad, with the last two joints transverse.

I have examined a series of thirteen specimens, which are practically identical, except that one, which I believe to be the male, is rather larger, with stouter legs and more dilated antennae.

Mycetina pusilla, sp. n.

Rufo-testacea, pedibus flavis, pronoti lateribus et elytrorum apicibus vage pallidioribus, antennisque nigris, articulis duobus basalibus exceptis; minor, ovata, convexa, nitida, pronoti lateribus antice valde arcuatis, postice fere rectis, paulo contractis; elytris sat brevibus, ovatis, convexis, parce leviter punctatis; pedibus antennisque sat gracilibus, harum articulo ultimo ad duos precedentes magnitudine fere aequali.

Long. 2·5 mm.; lat. max. 1·5 mm.

Hab. Tenasserim: Tavoy (*Doherty*).

This closely resembles *M. pallida* and is exactly the same in colour, but it is a little smaller and more gracefully shaped, the pronotum being relatively a little longer, the sides more strongly rounded in front and more contracted behind, the elytra shorter, more convex and more oval in outline and a little less strongly punctured. The antennae are more slender, with the joints not closely articulated, the club not much dilated, but the terminal joint considerably larger than the rest.

Mycetina pallida, sp. n.

Rufo-testacea, pedibus flavis, pronoti lateribus elytrorumque apicibus vage pallidioribus, antennis, articulis duobus basalibus exceptis, nigris; late ovata, nitida, modice convexa, pronoto brevi, lato, lateribus antice arcuatis, postice rectis, parallelis, basi recto, sulco basali ad marginem valde approximato; elytris parum elongatis, minute sat distincte punctatis, lateraliter explanatis; antennis compactis, clava sat lata, haud definita.

Long. 3 mm.; lat. max. 2 mm.

Hab. Tenasserim: Tavoy (*Doherty*).

M. pallida closely resembles *M. montivaga* Cziki, but is rather shorter and broader in shape, with the legs entirely pale and the antennae less slender and more compact. The joints of the latter increase so gradually that there is no perceptible division between the club and footstalk, but four or five joints are dilated. The species is also exceedingly like *M. nebulosa*, but the antennae are rather less wide, only two, instead of three, basal joints are red and the basal groove of the pronotum is closer to the hind margin.

Mycetina cinctipennis, sp. n.

Lacte flava, pronoti medio rufescenti elytrorumque medio toto nigro, antennis nigris, articulis duobus vel tribus basalibus rufis; late ovata, nitida, modice convexa, pronoto brevi, lato, lateribus antice arcuatis, postice fere rectis, paulo divergentibus, basi recto, sulco basali ad marginem valde approximato; elytris paulo elongatis, minute sed distincte punctatis, lateraliter leviter explanatis, antennis compactis, clava sat lata, haud definita.

Long. 3 mm.; lat. max. 2 mm.

Hab. Malay Peninsula: Perak (*W. Doherty*), Penang (*G. E. Bryant*, Oct.), Singapore (*C. F. Baker*); Sumatra: Merang (*Doherty*).

I have seen a single specimen from each of the above localities.

The sharply contrasted red and black colouring of this little species is very distinctive. In other respects it is very closely related to *M. pallida*, but a little shorter and broader in shape, with the elytra rather more convex.

Mycetina nebulosa, sp. n.

Rufo-testacea, pedibus, pronoti lateribus elytrorumque humeris et apicibus vage pallidioribus, pronoti basi elytrorumque disco plus minusve infuscatis, antennis nigris, articulis 3 basalibus rufis; late ovata, nitida, modice convexa, pronoto brevi, lato, subtilissime punctato, foveis basalibus profundis, rectis, ad medium attingentibus, lateribus antice arcuatis, postice fere rectis et parallelis, basi leviter arcuato, sulco basali ad marginem posticam haud valde approximato; elytris sat brevibus, minute sed distincte punctatis, lateraliter paulo explanatis; antennis compactis, clava lata.

Long. 2·5 mm.; lat. max. 1·75 mm.

Hab. Siam: Renong (*W. Doherty*); Tenasserim: Tavoy (*Doherty*).

There is a close resemblance to *Mycetina cinctipennis* and *M. pallida*, but the elytra are only vaguely clouded instead of having the whole central part black as in the former. The pronotum is rather narrower relatively than in either of those species, especially at the shoulders, and is a little produced backwards at the base, so that the basal sulcus is a little farther from the hind margin, which has a more rounded outline. The elytra are rather shorter and more broadly rounded behind, and the antennae are shorter, broader and more compact, with the three basal joints red.

Genus Pseudindalmus.

Pseudindalmus andamanicus, sp. n.

Rufo-ferrugineus, pronoto postice infuscato elytrisque nigris, singulo pallide bimaculato, maculis magnis subquadratis, anteriora ad margines basalem et exteriorem attingenti; oblongus, parum convexus, nitidus, pronoto subtiliter punctato, lateribus anguste marginatis, antice leviter arcuatis, angulis subacutis, postice parallelis, angulis rectis, basi sat late marginato; elytris undique fortiter punctatis, lateribus leviter arcuatis, anguste reflexis:

♂, antennarum articulo 9° valde inflato, tibia antica paulo pone basin obtuse dentata.

Long. 6 mm.; lat. max. 3 mm.

Hab. Andaman Is. (*Roepstorff*).

A series of specimens was collected by the late Consul Roepstorff. The colour of the elytral spots varies from bright yellow to blood-red, but some of the specimens are

immature. The four spots are large and irregularly quadrate, the anterior one reaching the front and outer margins at the shoulder, the posterior one equidistant from inner and outer margin. The antennae, legs, the front and sides of the pronotum and the lower surface of the body are also pale. The surface is entirely smooth and shining, the pronotum minutely and the elytra strongly punctured. It is of oblong shape and not very convex. The sides of the pronotum are nearly straight and parallel behind, the margins rather thickened, the elytra gently dilating from the shoulders and their lateral margins narrowly reflexed. The antennae are stout and compact and in the male the ninth joint is much larger than the two last joints combined. The front tibia in the same sex has a slight tooth near the base.

Pseudindalmus borneensis, sp. n.

Niger, capite, prothorace pedibusque fusco-rufis, utroque elytro bimaculato, maculis sanguineis, subrotundatis; oblongus, nitidus, supra subtilissime punctatus, oculis magnis; pronoti lateribus antice fortiter arcuatis, angulis obtusis, postice laevissime sinuatis, angulis acutiusculis, marginibus lateralibus paulo incrassatis, antice decrescentibus, basi late marginato; elytris quam pronoto parum latioribus, marginibus externis anguste reflexis:

♂, antennarum articulo 9° quam 10° paulo majori.

Long. 5 mm.; lat. max. 2·5 mm.

Hab. Brit. N. Borneo: Sandakan.

A single specimen of this species, taken by Prof. C. F. Baker, has been kindly presented by him to the British Museum Collection.

It is rather smaller than either of the species already described and more glossy, the elytra especially being much more finely punctured. The four red elytral spots are moderately large and of rather rounded form and the anterior ones do not reach the shoulders. The head and legs are deep red in the type specimen, and the pronotum is bright red in front, but becomes gradually darker towards the base. The eyes are large and the interval between them is distinctly less than their combined diameters. The front angles of the pronotum are blunt, the lateral margins are moderately thickened but gradually diminish towards the front angles, and the basal margin is broad. The elytra are less broadly rounded at the sides than in

P. tonkinensis Arrow (recently described in Ann. Mag. Nat. Hist.), with less conspicuously flattened margins.

In the male the 9th joint of the antenna is larger than the 10th, but scarcely as large as the 11th.

Genus Danae.

The genera *Danae* and *Saula* consist of very numerous and extremely similar minute species, which have so far received no careful study. In his monograph Gerstaecker described two species belonging to the first genus under the name of *Oediarthrus*, and stated that the enlargement of the 9th joint of the antenna was common to both sexes. This is a mistake which has led astray those who have followed him and has not been corrected in the recent catalogue. Weise has recognised the sexual character of the remarkable antennal structure, but has added to the existing difficulties by giving new names to female specimens. The 9th antennal joint is found in all degrees of development in the males of different species and is of normal form in the females, so that it is useless as a generic character, and the many species I have been able to bring together show that nothing remains by which it is possible to separate generically *Danae*, *Oediarthrus*, *Rhabduchus* and *Coniopoda*. All these are distinguished from *Saula* by the broadly margined prothorax and transversely elliptical scutellum. The genus *Heliobletus*, which Cziki has amalgamated with *Saula*, is intermediate between the latter and *Danae*, being (like *Saula*) without a wide prothoracic margin but, like *Danae*, having the scutellum transverse and rounded, while the antennae have also the 9th joint enlarged in the male, which has not hitherto been known.

In addition to this curious feature of the male antenna in these two genera, striking differences may also be found in the legs in the same sex and these afford the best means of distinguishing the species. The females, on the other hand, are so much alike that unless they can be associated without doubt with the other sex they are best left alone.

As already mentioned, I refer to *Danae* the North American "*Mycetina*" *testacea* Ziegl., which is not very remote from the Japanese *D. orientalis* Gorh. In these species external sexual differences are practically absent.

Danae rufula Reiche, *venustula* Gestro, *abdominalis* and

similis Weise and *Heliobletus servilis* Gorham, have all unfortunately been described from female types, and it may never be possible to establish with certainty the essential diagnostic characters of their species. The types of the first and last are in the British Museum.

Besides the curious differences in the antennae and legs, the males of *Danae* are generally more elongated than the females, owing to the enlargement of the metasternum and 1st abdominal segment and the consequent lengthening of the elytra. The hind legs are generally longer, placed farther back and frequently toothed at the inner edge of the femur or tibia.

Dr. Marshall found these insects at the roots of grass in damp places.

In a male specimen which I believe to agree with the female type in our collection of *Danae rufula* Reiche, the middle and hind tibiae are curved as in *Danae natalensis* Gerst., and the club of the antenna alone is black, but it is a rather larger species and more shining, the punctures upon the pronotum especially being fairly close but less coarse. The pronotum is also relatively wider, with more dilated margins. The supposed difference between *Danae rufula* Reiche and *D. bulbifera* Weise, described by Weise (viz. the marginal sulcus not diverging to the hind angle in the former) has no real existence but, from the size, *Danae bulbifera* is perhaps more likely to be *Danae natalensis*. Gerstaecker's figure of the latter, upon which Weise relied, is worthless and does not correspond with the description.

No species known to me has the 9th joint of the antenna shaped quite as represented in *Danae pulchella* Gestro, and *Danae senegalensis* Gerstaecker, is probably also different from any species in our collection.

Danae armata, sp. n.

Rufo-ferruginea, antennis (articulis basalibus exceptis) nigris; modice elongata, nitida, ubique flavo-pubescens; pronoto modice lato, subtilissime parce punctulato, lateribus laevissime bisinuatis, angulis posticis subacutis, marginibus parum latis, postice leviter arcuatim haud angulariter angustatis; elytris paulo fortius punctatis:

♂, antennis haud longis, articulis 4°–8° moniliformibus, subaequalibus, 9° inflato, ovato, apice truncato, subtus basi profunde excavato, 10° transverso, intus acute producto, 11° breviter ovali; femoribus

posticis fortiter curvatis, postice excavatis, medio leviter laminatis, tibiis omnibus apice paulo dilatatis, rectis, postica intus pone basin fortiter retrorsum dentata.

Long. 4 mm.

Hab. NYASALAND: Mlanje (*S. A. Neave*, Nov.); N. NIGERIA: Zungeru (*J. W. Scott-Macfie*, Nov.).

A single male from Nigeria appears to agree in all respects with a male and three females from Nyasaland.

The male of this species is easily recognised by the very peculiar structure of the hind legs (see page 41, fig. 3). The tibia bears a large and very prominent tooth placed a little beyond the base at the inner edge, in the form of a flattened plate, a little hollowed on its upper side, bluntly pointed and directed obliquely backwards, and the femur is curved, hollowed out behind, and has a broad rounded lobe or lamina at the middle of the upper edge of the excavation. All the tibiae are slender at the base and slightly thickened towards the extremity.

The inflated 9th joint of the antenna is very deeply scooped out beneath just beyond the base. The upper surface is shining, the pronotum rather flat and very lightly punctured, the sides very feebly excised behind, the hind angles scarcely produced and the elevated lateral margins not angularly narrowed behind but the inner edge very slightly curved towards the hind angle.

Danae tibialis, sp. n.

Rufo-ferruginea, antennis pedibusque (tarsis exceptis) nigris, nitida, ubique fulvo-pubescens, pronoto lato, parum convexo, lateribus postice fere rectis, angulis posticis vix acutis, marginibus elevatis, postice haud angulatim angustatis:

♂, corpore elongato, antennis robustis, articulis 2–8 moniliformibus, 9° valde inflato, pyriformi, longitudine ad latitudinem fere aequali, subtus leviter excavato, 10° transverso, 11° breviter ovali; pedibus gracilibus, tibiis rectis, tibiis posticis pone basin obtuse dentato, femoribusque posticis tenuis et curvatis.

Long. 4 mm.

Hab. NYASALAND; Mlanje (*S. A. Neave*, 11–12 Nov., 1912).

A single male specimen.

This has a very close resemblance to *D. femoralis* in which also the antennae, femora and tibiae are black, but the

hind femora of the male are much more slender and not toothed and the tibia instead bears an obtuse tooth beyond the base (see page 41, fig. 5). The 9th joint of the antenna in that sex is still more dilated, its diameter at the distal end, where it is widest, being about equal to its length. The shape of the thorax is practically the same, but it is a little more strongly punctured.

Danae dentipes, sp. n.

Rufo-testacea, antennis rufis, clava nigra, corpore elongato supra modice punctato, nitido, breviter pallide-pubescente, pronoto lato, lateribus postice fere rectis, angulis posticis vix acutis, marginibus elevatis haud latis, postice vix perspicue angustatis:

♂, antennarum articulis 2°–8° moniliformibus, 9° inflato, pyriformi, 10° brevi, intus producto, 11° breviter ovali, tibiis fere rectis, anterioribus 4 apices versus paulo latioribus, posticis gracilioribus, ante medium minute sed acute dentatis.

Long. 3·5 mm.

Hab. Rhodesia: Salisbury (*G. A. K. Marshall*, May). One specimen of each sex.

It is a rather pale species, with the antennae red and the last three joints only black. It is rather shining and very finely pubescent, but with well-marked puncturation above.

The sides of the prothorax are not at all sinuated behind and the hind angles are almost right angles. In the male the tibiae are straight, but the hind legs are elongate, the femora a little arched and the tibiae slender, with a small but sharp tooth before the middle of the inner edge, pointing backward (see page 41, fig. 2).

Danae femoralis, sp. n.

Rufo-ferruginea, antennis (sed articulis 2 basalibus fuscis) pedibusque intermediis et posticis (tarsis exceptis) nigris, minute punctata, nitida, ubique breviter fulvo-pubescens; pronoto lato, parum convexo, lateribus postice fere rectis, angulis posticis acute productis, marginibus elevatis, modice latis, postice leviter arcuatim, haud angulariter, angustatis:

♂, corpore elongato, antennis compactis, articulis 2–8 moniliformibus, 9 inflato, pyriformi, subtus paulo excavato, 10 brevi, 11 breviter ovali; pedibus sat tenuibus, tibiis intermediis et posticis femoribusque intermediis leviter arcuatis, femoribus posticis medio

fortiter sed obtuse dentatis, basi valde attenuatis; segmento ventrali primo medio laminato-producto.

Long. 3·3–4·3 mm.

Hab. NYASALAND: Mlanje (*S. A. Neave*, Nov.); UGANDA: Kakindu 3,400 ft., Mpanga Forest, 4,800 ft. (*S. A. Neave*, Aug. and Nov.).

This differs from all other species known to me by the black colour of the legs as well as the antennae. The pronotum is rather short, with the sides nearly straight behind and the marginal groove greatly curved and not abruptly bent towards the hind angle. The male has the elytra elongate, the 9th joint of the antenna swollen, pear-shaped and a little hollowed beneath, the middle and hind femora and tibiae gently curved, the hind femur bearing a strong but broad tooth behind (see page 41, fig. 4) and the first ventral segment very long and produced backwards in the middle.

Danae curvipes, sp. n.

Rufo-ferruginea, antennis nigris, articulis 2 basalibus exceptis; elongata, nitida, subtiliter parce punctulata, parum breviter pallide pubescens; pronoto lato, lateribus postice fere rectis, angulis vix acutis, marginibus haud latis, postice vix angustatis:

♂, antennarum articulis 2°–8° moniliformibus, subaequalibus, 9° inflato, breviter globoso, transverso, 10° brevi, intus producto, 11° ovali, acuminato; pedibus 4 anterioribus sat brevibus, tibiis versus apices paulo latioribus, mediis leviter curvatis, pedibus posticis longis, femoribus curvatis, tibiis postice valde curvatis, pone basin fortiter haud acute dentatis.

Long. 4 mm.

Hab. NYASALAND: Mlanje (*S. A. Neave*, Dec.).

Only a single specimen of this has been found. It is of very elongate form, but with a short transverse prothorax, whose sides are nearly straight behind and the hind angles nearly right angles. The puncturation is very minute and scanty but the pubescence fairly thick. The male characters are again very distinctive. The swollen 9th joint of the antenna is very short and transversely globular and the hind legs are long, with the femur slightly arched and the tibia slender throughout, strongly curved in its posterior half and armed internally a little behind the base with a conspicuous blunt tooth (see page 41, fig. 6).

Danae cavicollis, sp. n.

Rufo-ferruginea, antennarum articulis ultimis 6 vel 8 fuscis (apice extremo autem rufo); sat late ovali, nitida, ubique haud dense pallide pubescens; pronoto lato, profunde haud dense aut grosse punctato, angulis posticis fere rectis, marginibus sat latis, postice paulo angustatis, sulco basali profundo, utrinque fortiter contracto et excavato:

♂, pedibus haud longis, muticis, antennis robustis, articulo 9° inflato, truncato, 10° brevissimo, lato, 11° ovali.

Long. 3–3·5 mm.

Hab. Natal: Malvern (June); Rhodesia: Salisbury (Oct., Nov.). Series representing both sexes were taken and presented by Dr. G. A. K. Marshall.

It is a rather broadly oval species, uniformly coloured except for the last 6 or 8 joints of the antenna, which are dark (but not black) with the extreme tip reddish. It is very convex and shining, with fine but deep and distinct punctures. The sides of the pronotum are rounded and not distinctly bisinuated, the margins rather broad and only slightly narrowed behind. The base is very deeply sulcate and the borders of the sulcus both in front and behind become sharp and overhanging on each side, forming narrow-mouthed but very deep cavities, which extend into the angles formed by the base and the lateral margins of the pronotum. The elytra in both sexes are rather short, very convex and strongly rounded at the sides.

Danae longicornis, sp. n.

Rufo-ferruginea, antennarum articulis tribus ultimis nigris; elongata, pedibus antennisque gracilibus, nitida, ubique flavo-pubescens, pronoto modice lato, subtilissime sat crebre punctulato, lateribus laevissime bisinuatis, marginibus parum latis, postice vix angustatis; elytris paulo fortius punctulatis:

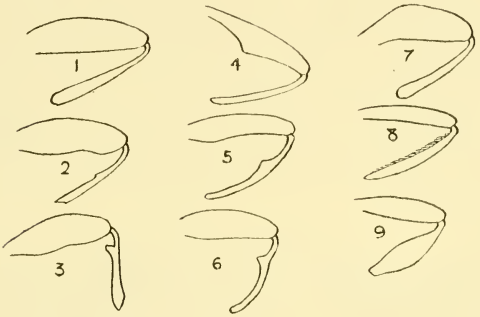
♂, antennis longis, articulis 1°–8° elongatis, 9° leviter inflato, 10° paulo minore, transverso, 11° ovali, pedibus longis, muticis, tibiis rectis.

Long. 3·5–4 mm.

Hab. Natal: Durban.

It is an elongate species, with straight slender legs (see page 41, fig. 1) and long antennae in both sexes and

distinguished from all others by the very fine close puncturation of the pronotum. The elevated margin of the latter is parallel-sided and not very broad, and the hind angles are very slightly acute. The legs and antennae (except the last 3 joints of the latter) are ferrugineous in colour like the rest of the insect. *Danae similis* Weise (also from Natal) has the same colouring, but the joints comprising the footstalk of the antenna are described as transverse. From this and the enlarged 9th joint it appears probable that the specimen described is a male, and not a female as stated.



Hind femur and tibia of—

Fig. 1. *Danae longicornis*, sp. n.
,, 2. *D. dentipes*, sp. n.
,, 3. *D. armata*, sp. n.
,, 4. *D. femoralis*, sp. n.
Fig. 5. *D. tibialis*, sp. n.
,, 6. *D. curvipes*, sp. n.
,, 7. *D. natalensis*, Gerst.
,, 8. *D. ciliatipes*, sp. n.
Fig. 9. *Heliobletus latipes*, sp. n.

Danae ciliatipes, sp. n.

Ferruginea, haud brevissime fulvo-pubescens, pedibus fuscis, antennis totis nigris, perspicue nigro-pubescentibus; robusta, nitida, supra subtiliter et sparsim punctulata, pronota lato, parum convexo, lateribus haud late marginatis, margine ad angulos posticos vix angustato, leviter bisinuatis, angulis posticis acutis; elytris convexis, elongatis, ad humeros latis:

♂, antennis longis, articulo 1° ovali, 2° brevi, 3° paulo elongato, 4°–8° fere globulis, 9°–11° elongatis, 9° quam aliis paulo latiori, 10° paulo breviori; pedibus gracilibus, femore intermedio postice

medio obtuse dentato, postico leviter arcuato et clavato, tibiis rectis, angustis, postica subtus sat longe fimbriata.

Long. 4 mm.

Hab. Tenasserim : Tavoy (*Doherty*).

The type is unique. In the antennae and legs the species is quite different from any other. The former are long, entirely black and clothed with rather long and close dark hairs. The last 3 joints are much larger than the rest, but do not greatly differ among themselves. They are all elongate, the 9th being the broadest, the 10th the shortest and the 11th the longest. The legs are slender, the middle femur bearing a blunt tooth beneath, the hind femur curved and slightly clubbed and the hind tibia closely fringed with rather long and stiff yellow hairs (see page 41, fig. 8). The 1st ventral segment bears a conical tubercle near the middle of the hind margin.

The upper surface is shining and very finely and lightly punctured. The pronotum is short and broad, with the elevated lateral margin not wide and not distinctly narrowed behind, the sides feebly sinuated behind and the hind angles acute.

Genus Heliobletus.

On the strength of an injudicious remark by Gorham, Cziki has sunk this genus as a synonym of *Saula*, and treated its Bornean type, *H. servilis* Gorh., as identical with the Ceylonese *S. ferruginea* Gerst. The two faunas are entirely distinct and the insects are generically different. Although only the unique female type of *H. servilis* is known, I believe the male will be found to have the 9th joint of the antenna swollen, as in *Danae*, whereas the sexes of *Saula* are practically identical externally. The antennae in the latter genus are extremely delicate, with slender, loosely-articulated joints. In *Heliobletus* they are thicker, with more compact and closely-articulated joints, the terminal one not very elongate and the penultimate (10th) strongly transverse. The 9th joint is generally perceptibly larger than the 10th, even in the female.

Heliobletus punctulatus, sp. n.

Ferrugineus, antennarum articulis 3 ultimis infuscatis; modice angustus, supra minute et crebre punctulatus, grisco-pubescens;

pronoto sat lato, lateribus antice leviter arcuatis, postice fere rectis, angulis posticis haud productis:

♂, antennis modice longis, articulis 2°–8° moniliformibus, 9° magno, inflato, subtus paulo excavato, pedibus gracilibus, tibiis anticis et mediis ad apices paulo latioribus.

Long. 3 mm.

Hab. S. E. Borneo: Martapura (*Doherty*).

This is a small insect, with the upper surface strongly punctured, as in *H. servilis*, but more finely and closely. The sides of the pronotum are much less strongly curved than in that species or *H. latipes*, being very gently rounded in front and nearly straight behind, with the hind angles right angles. The antennae are like those of *H. latipes*, but a little more slender, with joints 2 and 3 elongate, 4 to 8 beadlike and about as long as they are wide. The legs are slender and the tibiae nearly straight, but those of the front and middle pairs a little dilated towards the extremities.

I have seen only a single male specimen.

Heliobletus acuticollis.

Totus ferrugineus, antennis (basi excepto) nigris; sat robustus, minutissime punctulatus, nitidus, ubique grisco-pubescens, pronoto lato, subtilissime haud crebre punctulato, lateribus bisinuatis, angulis posticis productis, acutis; elytris paulo minus minute sed leviter punctatis:

♂, antennis crassis, articulis 3°–8° transversis, compactis, 9° magno, ovali, subtus leviter planato, pedibus gracilibus, tibiis simplicibus, fere rectis.

Long. 3·5 mm.

Hab. S. E. Borneo: Martapura (*Doherty*).

The general shape and colouring are exactly as in the other species, but the legs (of the ♂) are quite simple and the upper surface is shining and very finely and lightly punctured, especially upon the pronotum, the sides of which are distinctly bisinuated and the hind angles acutely produced. The antennae are massive, joints 3 to 8 very short and compact, 9 very large, almost regularly oviform and not excavated, 10 transverse, very slightly produced inwardly, and 11 shortly oval. The legs are slender, the tibiae almost straight and not at all dilated.

Heliobletus latipes, sp. n.

Totus ferrugineus, antennarum articulis 5°–6° ultimis nigris; modice angustus, griseo-pubescens, supra minute, sat crebre, punctatus, prothorace quam longitudinem paulo latiore, lateribus bisinuatis, angulis posticis vix acutis, basi haud lato, elytris fortiter convexis:

♂, antennis haud gracilibus, articulis 3°–8° transversis, compactis, 9° magno, inflato, subtus leviter concavo; pedibus crassis, pallidis, tibia postica pone basin dilatata, medio quam femorem haud angustiori.

Long. 3·3 mm.

Hab. S. E. Borneo: Martapura (*Doherty*).

This is rather smaller and more graceful and tapering in shape than *H. servilis*, as well as more finely punctured.

The antennae and legs are rather stout, the 3rd to 8th joints of the former being short and compact, the 9th large, shortly oval and slightly excavated beneath, the 10th small, transversely triangular, and the 11th shortly oval. The middle and hind tibiae are dilated beyond the base, the latter about as wide as the femora (see page 41, fig. 9). The entire surface, including the antennae and legs, is clothed with a fine yellowish-grey pubescence.

A second male specimen from Perak appears to belong to the same species.

Genus Aphorista.

A. humeralis Gorh., is synonymous with *A. morosa* Lec.

Genus Epipocus.

The Central American species of *Epipocus* have been greatly confused by Gorham, partly owing to his having failed to correctly distinguish the sexes, and his grouping of them according to the shape of the tips of the elytra is misleading. This feature varies to a greater or less extent according to the sex. Thus, although *E. bivittatus* is grouped by him as a species with the apex of the elytra rounded and the male is said to differ from the female only in having a minute tooth near the apex of the front tibia, he has figured a male showing no tibial tooth (which is very distinct but at a distance from the apex), but correctly representing the extremities of the elytra as truncated and sharply pointed. The sexes can be distinguished with

the greatest ease in this genus by the great difference in the terminal part of the abdomen, the males having a rather long and more or less asymmetrical sixth segment, often exposing on the left side a slender chitinous ramus of the aedeagus.

The description and figure of *E. sallaei* Gorh., are of the male and not the female as supposed, and the dilated elytra may be a male characteristic. There is no tooth to the front tibia in this sex, but all the tibiae are curved and rather clavate.

The two specimens supposed by Gorham to be male and female of *E. subcostatus* Gorh., are both males, and that described as the female of *E. brunneus* Gorh., may be that of *E. subcostatus*, but the type specimen of *E. brunneus* is identical with the earlier-described *E. mollicomus* Gorh., the original specimens of which are very immature.

The specimens referred by him to *E. rufitarsis* Chevr., include *E. fuliginosus* Guér., and, judging by the considerable differences in the aedeagi of the males, several other species as well, but more adequate series are necessary to enable these to be satisfactorily described.

The Mexican specimens referred to *E. unicolor* Horn, belong to a new species, which may be called

Epipocus parvus, sp. n.

Flavus, antennarum articulis 6°–10° brunnescentibus, paulo nitidus, haud dense punctatus, sat sparse haud minute pubescens; pronoto valde transverso, lateribus antice fortiter curvatis et contractis, foveis basalibus profundis et angustis, antice sat late fossulatis; elytris convexis, longe cordiformibus:

♂, elytris apice oblique truncatis, tibia antica intus dentata:

♀, elytris haud truncatis.

Long. 5·5 mm.

Hab. Mexico: N. Sonora (*Morrison*).

This differs from the N. American *E. unicolor* in being rather smaller, lighter coloured, more shining and clothed with longer hair. The pronotum is much more narrowed in front and the antennae are much more slender.

Genus Anidrytus.

I can find no difference between specimens in the British Museum labelled as types of *Anidrytus bisignatus* and

angustulus, of Gerstaecker, except in size and a rather greater elongation in the latter, and I am not convinced of the separateness of the two species.

The specimen from San Joachin, Guatemala, referred to *A. liquefactus* by Gorham (Biol. Centr.-Amer. vii, p. 126), figures again two pages later in the same work as *Anidrytus* ? sp. It is very obviously different from *A. liquefactus*, and Gorham is quite wrong in saying that it is without an internal tooth to the front tibia, for there is a very strong one produced by the abrupt dilatation of the apical part, which is much less flattened and bent than in the other male specimen described by him. This species may be called

Anidrytus guatemalae, sp. n.

Gorham has given a description of the unique specimen, but besides the features mentioned by him it is considerably longer and narrower than *A. liquefactus*, more densely punctured and pubescent, scarcely shining and with much more slender legs and antennae.

Length 8 mm.; breadth 5 mm.

Ephebus depressus Gorh., has all the characters of *Anidrytus*, to which it must be referred. As Gorham later used the same specific name for a Guatemalan member of this genus, the latter must be renamed and I propose to call it

Anidrytus decoratus, nom. nov.

Anidrytus fallaciosus Gorh., appears to be *A. ephippium* Gerst., from which, although described from the same region, Gorham did not attempt to distinguish it. The pronotum is not, as he states, more deeply punctured in the middle than at the sides. This error, as well as the general inadequacy of the description, was no doubt due to the extremely dirty state of his specimen.

The following new species is closely related to the last. It appears to resemble none of the Peruvian species described by Kirsch.

Anidrytus humeralis, sp. n.

Ferrugineus, antennarum articulis sex ultimis (sed apice rufescente) pronoto elytrisque nigris, illius lateribus (postice angustius) elytrorumque humeris et apicibus ferrugineis; oblongus, supra

crebre et minute punctatus, breviter fulvo-hirsutus, prothoracis lateribus postice fere parallelis:

♂, tibiis anticis ante apicem minute haud acute dentatis.

Long. 5·5–7 mm.; lat. max. 3–4 mm.

Hab. Ecuador: Macas (*Buckley*); Peru; Colombia.

It is a little less ovate than *A. ephippium*, the pronotum being rather broader in front and less gradually rounded. Its dark area is much narrower in front than behind, where it usually reaches the hind angles. Upon the elytra the dark patch extends almost to the outer edges, enclosing a conspicuous humeral spot, and its posterior margin is jagged near the suture. In the male the front tibia is curved, thickened at the end, with a minute sharp tooth, which is absent in *A. ephippium*. *A. plagiatus* Gerst., is evidently closely similar, but has the front tibia of the male differently formed.

Anidrytus fuscus, sp. n.

Nigro-piceus, pedibus, antennarum articulis 5 basalibus apiceque extremo, pronoto (disco nonnumquam excepto) elytrorumque humeris et apicibus obscure rufis; modice latus et depressus, ubique fortiter sat crebre punctato, haud dense fulvo-pubescens:

♂, tibiae anticae dimidio inferiore paulo latiori, intus multo ante apicem acute spinoso.

Long. 4·5–5 mm.

Hab. E. Brazil: Pernambuco.

A considerable series of this formerly in the collection of Alexander Fry vary in colour from light brown to nearly black, but in fully coloured specimens the five basal joints and the extreme tip of the antennae, the sides of the prothorax, the shoulders and extremities of the elytra, and the legs are reddish and the remaining parts very dark. It is a rather small, short and broad insect, not very convex and rather strongly and closely punctured.

It was taken in March by Mr. Fry and was also found by the late E. Gounelle.

Anidrytus pilosus, sp. n.

Omnino flavus, supra dense sat longe pallide flavo-pilosus, antennarum articulis sex ultimis plus minusve obscurioribus; breviter ovatus, convexus, pronoto lato, lateribus antice curvatis, postice

rectis, foveis basalibus profundis, fere ad medium attingentibus, antennarum articulo ultimo fere discoidali, duabus praecedentibus intus valde productis :

♂, tibia antica graciliori, subtus post medium dentata.

Long. 5·5 mm.

Hab. S. Brazil : Espirito Santo (*Schmidt*).

This is easily recognisable by its thick and rather long clothing of pale sulphurous-yellow hair. Two specimens (male and female) from the Fry Collection, although evidently of the same species, differ considerably in form. The male is very short and broad, with the sides of the prothorax gently curved in front and divergent behind and the hind angles acutely produced. The female is narrower, the sides of the thorax are strongly rounded in front and parallel behind, and the hind angles are right angles. The club of the antenna is longer and the 9th and 10th joints less transverse and less angulated anteriorly. The front tibia of the male is slender and curved in its anterior half and toothed beneath a little beyond the middle.

Genus Epopterus.

The South American *Epopterus ocellatus* Oliv., must be removed from the list of Central American species. The common insect so named by Gorham, which, in spite of its different aspect, appeared to him impossible to separate satisfactorily, is not likely to cause similar difficulty to others. It is a larger, broader and less closely punctured and hairy insect, with a pattern composed of only two, instead of three, colours as in *E. ocellatus*. I consider it to belong to *E. partitus* Gerst., but with the black markings rather more reduced than in the typical form.

Genus Stenotarsus.

Cziki has introduced a new name, *Stenotarsoides*, for the Asiatic species of *Stenotarsus*. This he describes as a genus, although without indicating a single distinctive character. While separating, according to his notions of propriety, the Asiatic species, he associates still the American and African, whether from geographical or zoological reasons is immaterial, since his so-called genus, in the absence of any diagnostic character, cannot reasonably be held to have any substantial existence. It is true that the International Rules of Nomenclature recognise

the "indication" of species as sufficient to validate a new generic name, but the fact that this would permit any cataloguer to introduce genera upon fantastic grounds which, as in the present case, may not even pretend to be morphological, seems to preclude the possibility of its ever being generally adopted.

Gerstaecker pointed out more than half a century ago that (as would be expected) the African species of *Stenotarsus* are, in certain respects, more nearly related to the Oriental species than to the American, and Gorham, in describing the Japanese *S. internexus*, has noticed that it forms the connecting link between the New World and Old World forms. The genus is in fact a worldwide one, passing with scarcely perceptible change of form from Tropical Asia through Japan to North and Tropical America, like the Mongolian race of men, and through the Eastern Tropics to Australia and Madagascar (*S. internexus*, just mentioned, has an obvious relationship to the N. American *S. hispidus*).

S. guineensis Gerst., ranges from Sierra Leone to Uganda, and *S. aequatus* Gorh., is a synonym for it. Gorham notes that his type is much less pubescent than *S. guineensis*. This is true, the clothing having been rubbed off so that scarcely a trace remains. *S. mombonensis* Weise, is exceedingly similar, but the raised margin of the thorax is narrower and the footstalk of the antenna only pale at the base. It is common in Nyasaland and Gazaland.

Stenotarsus ursinus and *S. leoninus* have been described as unicolorous species, but examples of both occur in which the elytra are marked with black spots in the same position as in *S. pantherinus* Gorh., the basal one, however, more broadly adjacent to the anterior margin. In *S. ursinus* the spotted form seems peculiar to North Borneo, while Sarawak specimens never show more than a slight indication of spots.

Gorham appears to have been wrong in attributing Central American specimens to *S. claviger* Gerst., the form of the antennal club in these agreeing rather with that of *S. validicornis*. The specimen from St. Catherina referred to by Gerstaecker as belonging to *S. claviger* was in Gorham's collection (now in the British Museum), but this specimen does not agree with the description and must have been too hastily examined by Gerstaecker. I believe it to be a rather large specimen of *S. minutus*.

The specimen from Guatemala attributed to, and figured as, *S. maculicollis* Gerst., in Biol. Centr.-Amer. vol. vii, although extremely similar, must be separated from it, the antennae being considerably shorter and more compact and the club distinctly larger proportionately to the footstalk. The sides of the pronotum are more strongly curved and nearly parallel behind, and the raised margins broader. In both species the basal foveae form very deep and strongly oblique channels.

The Central American species may be called

Stenotarsus marginalis, sp. n.

S. maculicollis Gerst., really belongs to the section with elongate joints to the footstalk of the antenna.

The genus evidently forms exceedingly numerous local races in Tropical America, some of them having slight structural differences, while some, like *S. tarsalis* Gorh., seem to me no more than colour varieties (the latter of *S. circumdatus* Gerst.). Gorham has pointed out nothing to distinguish his *S. cordatus* from *S. globosus* Guér., and I have found nothing. The difference in the size of the thorax shown in his figures is quite imaginary. He evidently did not compare his specimens or he would have found the length of the legs to be distinctive of the males of *S. globosus*.

The specimens from Guatemala referred by him to *S. orbicularis* Gerst., do not agree in the least with the description of that species. They have no resemblance to *S. rubicundus* and are not at all orbicular. As Gorham has described the form it is sufficient to give it a name and I propose to call it

Stenotarsus ovalis, sp. n.

It is almost regularly oval in shape, with the shoulders less prominent and the elytra less convex than in *S. globosus*. There are two specimens, male and female, the male having the legs and antennae elongated, as in *S. globosus*.

The specimen from Panama is not conspecific with the last. Its pronotum is more closely punctured, the sides less strongly rounded, the front angles less prominent, and the lateral margins much narrower. It may be called

Stenotarsus chiriquinus, sp. n.

The sexual features mentioned above (*i. e.* the elongation of the legs and antennae of the males), although recognised by Gerstaecker, were ignored by Gorham. The latter's *S. macroceras* is the male of *S. purpuratus* Gerst. Still more remarkable than the great elongation of the antennae and legs in that form is the sharpening of the hind angles of the prothorax.

There is no valid reason for the inclusion of *S. adumbratus* Gorh., in the Central American fauna, the specimen from Tactic so identified being quite different from the Colombian type with short antennae to which alone the description applies. The Guatemalan species may be called

Stenotarsus guatemalae, sp. n.

Deep chestnut-red, with the last four joints of the antenna black. Oval, convex and very shining, with a moderately coarse clothing of tawny hair. The pronotum is very minutely punctured, with its sides little curved, divergent from front to hind angles, the lateral margins narrow and the hind angles acute. The antennae (of the male) are slender, fully two-thirds as long as the body, with the joints elongate, except the 8th, 9th, and 10th, of which the 8th is beadlike, the 9th about as long as it is wide, and the 10th transverse, the last three joints not greatly dilated but very loosely articulated. The elytra are finely but distinctly and not closely punctured, the punctures being larger behind the shoulders.

Length 3 mm.

Hab. GUATEMALA, VERA PAZ: Tactic, Purula (*G. C. Champion*).

Another closely allied Guatemalan species was confused by Gorham with *S. sallaei*, which is apparently peculiar to Mexico. I propose to name this

Stenotarsus distinguendus, sp. n.

Deep mahogany-red, with the last four or five joints of the antennae black.

Elongate-oval, shining, with a moderately coarse clothing of tawny hair. The pronotum is minutely and densely punctured, with the sides little curved, divergent from front to base, the raised margins narrow, not widened in front, the basal foveae very deep and the hind angles acute. The elytra are rather closely and

not very finely punctured, with larger and more scattered punctures at the sides. The antennae are slender, with the 1st to the 7th joints elongate, the 8th slightly elongate in the male and transverse in the female, the 9th to the 11th strongly dilated, the 10th distinctly transverse and the 11th twice as long. The legs, as well as the antennae, are more slender in the male.

Length 4 mm.

Hab. Guatemala, Vera Paz: Sabo, Tactic, Sinanja (*G. C. Champion*).

This is larger, more punctured and less shining than *S. guatemalae*, but less finely and closely punctured than *S. sallaei*, and the thoracic margins are narrower than in that species and less rounded.

Stenotarsus latipes, sp. n.

Pallide flavus, minute fulvo-pubescens, antennarum articulis 3 et 4 rufescentibus, 5–11 nigris; elongato-ovalis, pronoto subtiliter crebre punctato, lateribus parum arcuatis, antrorsum valde approximatis, angulis posticis acutis, marginibus angustissimis; elytris crebre et confuse punctatis; antennis gracilibus, articulo penultimo transverso, 8° globoso, ceteris omnibus elongatis:

♂, antennis gracilioribus, tibiisque latis, valde curvatis.

Long. 5·5 mm.

Hab. Mexico: Jalapa (Hoege), Juquila; Guatemala: St. Geronimo, 3,000 ft. (*G. C. Champion*).

This has only a superficial resemblance to the S. Brazilian *S. angustulus* Gerst., to which Gorham referred the specimens here described. It is much more finely and closely punctured, with finer and less pale pubescence. The sides of the pronotum are less rounded, the margins narrower, and the antennae have only two entirely pale joints. The broad, flat, strongly curved tibiae of the male are very peculiar.

Stenotarsus rotundus, sp. n.

Fulvus, antennarum articulis sex ultimis infuscatis; late ovatus, pedibus antennisque paulo elongatis, harum articulo secundo globoso, 10° transverso, ceteris elongatis, corpore supra parum dense fulvo-vestito, pronoto lato, cum capite fere semicirculari, margine laterali lato, foveis basalibus profunde impressis; elytris sat fortiter et aequaliter haud parce punctatis.

Long. 5 mm.; lat. max. 3·5 mm.

Hab. Panama : Volcan de Chiriqui, 2,000–3,000 ft. (*G. C. Champion*).

The single specimen of this species was not distinguished by Gorham from *S. pilatei*, of which it has the colour and size, although otherwise entirely different. It has a very regular broadly oval outline, the pronotum being almost exactly semicircular in shape, allowing for the emargination which receives the head. The raised margins are very broad and only a very little narrower behind than in front. The elytra are rather strongly, evenly and closely punctured. The legs and antennae are slender, the last six joints of the latter dark and the club loosely articulated and not much dilated.

Stenotarsus subtilis, sp. n.

Fulvus, antennarum articulis 6 ultimis fuscis : ovalis, prothorace brevi, anguste marginato, lateribus parum arcuatis; elytris crebre minute punctatis, dense fulvo-vestitis; antennarum articulo 2 globoso, ceteris elongatis.

Long. 6 mm. ; lat. max. 4 mm.

Hab. Panama : David, Volcan de Chiriqui (*G. C. Champion*).

This rather closely resembles *S. pilatei* Gorh., with which it was confused by Gorham, but it is more broadly oval and less attenuated behind, and the elytra are very finely and closely punctured, without large scattered punctures. The antennae have six, instead of four, joints dark and all but the second joint are elongate. The legs are longer in the male than in the female.

The two insects associated by Gorham as forming his genus *Systaechea* are very obviously not nearly related. The figure of the second species, *S. championi*, does not accurately represent the antennal club, which is compact and rather abrupt—indeed, exactly as in *Anidrytus*—and entirely different from that of the first species, *Systaechea cyanoptera*. If compared with *Anidrytus dolosus* Gorh. (from the same locality) it will at once be seen that it is really a closely-allied species of the same genus. *S. cyanoptera*, which must be regarded as the type of *Systaechea*, has no tangible character by which it can be distinguished from *Stenotarsus*, although a rather isolated species. The raised margin of the pronotum is very

narrow, but not more so than in *S. latipes* (included in *Stenotarsus* by Gorham).

Stenotarsus malayensis, sp. n. (Plate I, fig. 2.)

Fusco-castaneus, pedibus antennisque rufis, harum clava autem nigra; late oblongus, subnitidus, sat longe fulvo-pubescens, pronoto parce et minute punctulato, marginibus lateralibus antice latis, postice paulo angustatis; elytris fortius et crebrius punctatis, lineis punctorum majorum lateralibus vagis; antennis modice longis, clava laxe articulata, longitudine ad articulos 2°–8° conjunctos fere aequali, articulo ultimo ad duos praecedentes aequali.

Long. 4 mm.; lat. max. 2·5 mm.

Hab. Borneo: Pengaron (*Doherty*); Malay Peninsula: Perak (*Doherty*), Penang (*G. E. Bryant*).

This evidently rather closely resembles *S. birmanicus* Gorh., but the regular striation of the elytra is replaced by irregular vague lines of rather larger punctures traceable only upon the outer part of the elytra. It is broadly oblong in shape, tawny-red in colour, except the last 3 or 4 joints of the antenna, and clothed with rather coarse tawny pubescence. The upper surface is moderately shining, especially the pronotum, which is rather thinly punctured and pubescent. The lateral margins are broad in front and a little narrowed behind. The antennae are moderately long, joints 2 to 8 short and compact and together about as long as the three last, which form a loosely-jointed club, the terminal joint of which is about twice as long as it is wide and the other two rather transverse.

Stenotarsus musculus, sp. n.

Totus fulvus, antennarum clava nigra; late ovalis, supra undique dense subtiliter punctatus et breviter fulvo-pubescens, prothoracis margine laterali antice lato, postice paulo attenuato; elytris regulariter punctato-striatis, striis exterioribus paulo fortioribus, duabus lateralibus antice conjunctis, abbreviatis; antennarum clava longa, ad articulos reliquos conjunctim longitudine aequali, articulo 9° quam 11° vix breviori.

Long. 4 mm.; lat. max. 2·75 mm.

Hab. Borneo: Pengaron (*Doherty*).

There are three specimens in the British Museum.

This also is evidently very similar to *S. birmanicus* Gorh., but with a longer antennal club. It is rather paler in colour than *S. malayensis*, larger and more oval in shape and very finely and densely punctured above, with a clothing of very short, close and regular pubescence. The elytra bear regular lines of fine but larger punctures, which become progressively stronger from the suture to the outer margin, the two outermost lines uniting behind the shoulders and abbreviated behind, and the 3rd and 5th intervals wider than the rest. The black club of the antenna is long, about as long as the entire footstalk, of which joints 2 to 8 are short and close. The terminal joint is little longer than the 9th joint.

Stenotarsus nigripes, sp. n.

Fusco-rufus, pedibus, antennis corporeque subtus nigris; pronoti disco nitido, subtilissime punctato et parce setoso, lateribus fortiter arcuatis, marginibus sat angustis at valde elevatis, basi sulco profundo anguste marginato; elytris fortiter punctatis, absque lineis distinctis, breviter sat dense grisco-pubescentibus; pedibus antennisque gracilibus, harum articulis omnibus elongatis, 3°–9° duplo circiter longioribus quam latioribus, ultimo haud longe ovali.

Long. 4. mm.; lat. max. 3 mm.

Hab. Assam: Manipur (*Doherty*).

A single specimen.

The species is easily recognisable by its entirely black and rather slender legs and antennae. The upper surface is deep red in colour, a little paler at the sides of the pronotum, and not very densely clothed with fairly coarse greyish pubescence, scanty upon the middle of the pronotum, which is smooth and shining. The lateral margins of the latter are strongly elevated, but not wide, and there is a deep basal sulcus or stria close to the margin. The elytra are strongly and irregularly punctured, without distinct lines, moderately broad behind the shoulders and tapering at the apices. The joints of the antennae are all elongate, except the 2nd and 10th, the club not strongly marked and the last joint less than twice as long as wide.

Stenotarsus globulus, sp. n.

Fusco-castaneus, pedibus antennisque rufis, harum articulis 2 vel 3 penultimis ultimique parte basali fuscis; globosus, subnitidus,

undique fulvo-pubescens, pronoto aequaliter minute et crebre punctulato, marginibus lateralibus sat latis, obliquis; elytris convexis, minus subtiliter punctatis, punctis inaequalibus, sublineare ordinatis; antennis haud longis, articulo 9° globoso, 10° transverso, 11° ovali.

Long. 2·5 mm.; lat. max. 2 mm.

Hab. SARAWAK: Mt. Matang.

Several specimens were found in January and February by Mr. G. E. Bryant.

It is a small globular species of dark chestnut colour, with the legs and antennae pale, except the 9th, 10th and the basal half of the last joint of the latter, which are dark. It is entirely clothed above with a yellowish pubescence, which is rather less fine than in the two following species, especially upon the elytra. The pronotum is finely, closely and evenly punctured, with wide lateral margins and without a basal stria. The elytra are rather more coarsely punctured, with an indication of alternating longitudinal bands of larger and smaller punctures at the sides. The antennae are a little stouter than in *S. basalis*, with the 9th joint nearly globular, the 10th rather transverse and the last elongate-oval.

S. contractus Gorh., from Burma, is evidently very like this, but the lateral margins of the pronotum are there very narrow.

Stenotarsus basalis, sp. n. (Plate I, fig. 3.)

Fusco-castaneus, prothoracis lateribus, humeris antennisque flavescentibus, sed harum articulis 9° et 10° nigris; subglobosus, modice nitidus, ubique subtiliter flavo-sericeus, pronoti marginibus latissimis, subtiliter rugosis, opacis, densius sericeis, extus regulariter arcuatis, angulis anticis prominentibus, disco aequaliter minute et crebre punctato, postice late lobato, stria basali recta profunde incisa; elytris similiter punctatis, absque lineis, lateribus arcuatis, anguste reflexis; antennis sat gracilibus, clava laxe articulata.

Long. 3 mm.; lat. max. 2 mm.

Hab. SARAWAK: Mt. Matang.

Two specimens were found by Mr. Bryant in December.

This is another very short and globose species of nearly the same size, shape and colour as the preceding, but a little larger and more elongate. The lateral margins of the pronotum are still broader, flatter, more opaque and

more densely pubescent, and the base has a deeply incised stria, which is rather distant from the margin in the middle but almost touches it at the lateral foveae. The elytra are finely and uniformly punctured, without longitudinal lines, and their lateral margins are narrowly reflexed. The antennae are rather more slender than those of *S. globulus*, with their terminal joint pale and the two preceding ones black.

Stenotarsus tristis, sp. n.

Fusco-brunneus, antennis pedibusque rufis, illorum articulis 9° et 10° nigris; globosus, haud nitidus, corpore supra ubique aequaliter minute et dense punctulato et breviter pubescenti; pronoto semicirculari, marginibus lateralibus sat latis, obliquis, intus alte elevatis; elytris convexissimis, marginibus paulo reflexis; antennis brevibus, articulo ultimo breviter ovali, penultimo brevissimo, lato.

Long. 2·5 mm.; lat. max. 2 mm.

Hab. Borneo, Sarawak: Mt. Matang.

Two specimens were found by Mr. G. E. Bryant in January 1914.

S. tristis is a very small species of very globular form and dark brown in colour. The legs and antennae are red, but the two penultimate joints of the latter nearly black. The antennae are short, the last joint shorter than in *S. basalis* and *globulus* and the preceding one very short and broad. The puncturation of the upper surface is very fine and close and the pubescence correspondingly finer than in the two allied species. There is a rather indefinite transverse impression, but no sharply incised line (as in *S. basalis*) before the base of the pronotum, and the lateral margins are a little less broad than in that species and less horizontal, their inner edge being more strongly elevated.

Stenotarsus femoralis, sp. n.

Laete rufus, prothoracis medio usque ad basin (sed haud antice) utriusque elytri medio antennarumque clava nigris, hujus apice pallido; rotundatus, convexus, crebre et minute punctatus, subtiliter pubescens; pronoto brevi, fere semicirculari, angulis omnibus subrectis, marginibus latissimis, basi late lobato, stria fere recta profunde inciso; elytris haud seriato-punctatis; antennis gracilibus,

articulis tribus ultimis laxe connexis, apicali longe ovali; femore postico subtus post medium acute dentato.

Long. 2·5–3 mm.; lat. max. 2–2·5 mm.

Hab. Java; Malay Peninsula: Perak (*W. Doherty*).

Although the tooth behind the middle of the hind femora is probably a feature of the male, it is present in all the four specimens I have seen.

The species is very short and globose in form, with a large black patch in the middle of the pronotum and of each elytron. It is closely and finely punctured, pubescent and not very shining and the elytra have no distinct rows of punctures. The lateral margins of the pronotum are very broad and little contracted behind and the base is lobed, the lobe cut off by a nearly straight impressed stria. The antennae are long and slender and the club loosely jointed, with a very long terminal joint.

S. lituratus Gerst., the only other known species of the genus from Java, is a larger insect, with striate elytra and reduced black marking.

Genus Chondria.

Gorham was quite wrong in describing this genus as more closely allied to *Symbiotes* than to *Stenotarsus*. The tarsi are not, as he says, quite simple, but are entirely unlike those of *Symbiotes*, of which the first three joints are short and of nearly equal size. In *Chondria*, the first is elongate, the second produced, much less than in *Stenotarsus* but beyond the third joint, which is very small and inconspicuous. Everything else is as in *Stenotarsus*, of which it is therefore only a rather simplified, perhaps degenerate, form. The production of the second joint is more apparent in the hind feet than in the anterior ones. Cziki, in Ann. Mus. Nat. Hung. iii, 1905, p. 573, has actually described the second joint as long and bilobed, from which it is evident that he does not know the genus. Only a single species has been known hitherto, but several more are described here, each represented only by a single specimen.

Chondria seriesetosa, sp. n. (Plate I, fig. 6.)

Omnino fulva, longe fulvo-hirta, late ovata, alte convexa, nitida; pronoti lateribus antice rotundatis, postice rectis, parallelis, angulis

anticis obtuse rotundatis, stria basali recta profunda; elytris brevibus, grosse haud crebre lineato-punctatis, longe sat sparsim aureo-pilosis, pilis lineare ordinatis, lineis alternis erectis et retrorsum inclinatis.

Long. 2·5 mm.; lat. max. 1·5 mm.

Hab. Borneo, Sarawak: Mt. Matang.

A single specimen of this beautiful species was found by Mr. G. E. Bryant in December 1913. It is a little larger than *C. lutea* Gorh., and more stout and globular in shape. The sides of the prothorax are a little more rounded in front and not serrated, the angles are less prominent and the basal stria is nearly straight and farther from the hind margin. The elytra are much shorter and more convex, the punctures larger, more regular and less close together, and the clothing of stiff hairs not close and irregular but arranged in quite regular rows. The large serial punctures each give rise to a stiff golden hair which is pointed obliquely backwards, and between each two of the longitudinal rows so formed there is another row of similar but longer and erect hairs. As in *C. lutea*, the head, the broad thoracic margins and the antennae are clothed with similar long hairs, the club of the antenna is very loosely articulated, the first and second joints composing it transverse and nearly twice as long as those preceding, and the terminal joint broadly oval. The footstalk is much longer than the club.

Chondria indica, sp. n.

Lacte fulva, antennis (basi excepto) nigris, sat dense erecte fulvo-hirta; late ovalis, convexa, pronoto ponc basin haud marginato, utrinque profunde fossulato, lateribus leviter arcuatis, postice divergentibus, marginibus antice latis, postice attenuatis; elytris regulariter seriato-punctatis, interstitiis sat dense pilosis; antennis gracilibus, articulis 1°–8° paulo elongatis, 9° et 10° longitudine ad latitudinem aequalibus, 11° breviter ovali.

Long. 3 mm.; lat. max. 2 mm.

Hab. S. India: Nilgiri Hills (*H. L. Andrewes*).

This is larger, more hemispherical and much more closely hairy than *C. seriesetosa*. It is clothed with erect yellow hair, longitudinally arranged upon the elytra as in that species, but in rather dense bands separated by narrow lines which coincide with the lines of punctures.

The pronotum is without a basal stria and the antennae are more slender than in any other known species.

Chondria ovalis, sp. n.

Fulva, antennarum clava nigra (apice extremo excepto); ovalis, dense breviter luteo-pilosa, pronoto haud nitido, minute punctato, lateribus regulariter arcuatis, marginibus haud latis, postice paulo attenuatis, stria basali subtili arcuata, ad marginem valde approximata; elytris regulariter seriato-punctatis, intervallis minute punctulatis; antennis haud longis, articulis 2°–8° globosis, compactis, 9° et 10° brevibus, 11° ovali, ad duos praecedentes longitudine aequali.

Long. 3·5 mm.; lat. max. 2 mm.

Hab. Malay Peninsula: Penang (*G. E. Bryant*, Nov. 1913).

This is rather larger, more closely and finely pubescent and more regularly oval in outline, than any other known species. The sides of the prothorax are not serrated, rather more evenly rounded and the margins not quite so broad as in *C. lutea* and *seriesetosa*, and the basal stria is very fine and close to the basal margin, the curvature of which it follows. The elytra are longer than in the other species and finely punctured, with regular rows of larger punctures. The antennae are not long, joints 2 to 8 are very compact and together about as long as the club, of which the first two joints are transverse and together about as long as the last. The club is black, but with the extremity of the last joint red.

Chondria triplex, sp. n. (Plate I, fig. 1.)

Rufa, prothoracis medio usque ad basin (sed haud antice) utriusque elytri medio antennarumque clava nigris, hujus apice pallido; breviter ovata, convexa, modice nitida, undique fulvo-pubescens, pronoto brevi, fere semicirculari, angulis omnibus fere rectis, marginibus latis, basi stria subtili ad marginem valde approximata impresso; elytris fortiter punctato-striatis; antennis modice longis, articulis tribus ultimis laxe connexis, fere ad reliquos longitudine aequalibus, articulo apicali longissimo.

Long. 3 mm.; lat. max. 2 mm.

Hab. Java: Selabintanah (*G. E. Bryant*, April).

This has the coloration and pattern of *Stenotarsus femoralis*, which also occurs in Java. It is of similar size and shape, being more rounded in outline and more convex than any of the species of *Chondria* just described. It is easily distinguishable from *S. femoralis* by the well-marked striae upon the elytra. The pubescence upon the upper surface is similar. The antennae are a little less slender, the club equally long, but the joints preceding it more short and compact. The base of the pronotum has a fine stria very close to the margin.

Chondria globulosa, sp. n.

Tota fusco-rufa, sat dense griseo-pubescens; breviter ovalis, fere globulosa, pronoti medio convexo, nitido, subtiliter parce punctulato et hirsuto, lateribus regulariter arcuatis, serratis, marginibus sat latis, basi fortiter sulcato, sulco a margine modice distanti; elytris regulariter seriato-punctatis, interstitiis subtilissime punctulatis; pedibus antennisque haud gracilibus, harum articulis 2°–8° globosis, compactis, 9° et 10° brevibus, 11° ad duos praecedentes longitudine aequali.

Long. 2·5 mm.; lat. max. 1·5 mm.

Hab. Borneo, Sarawak: Mt. Matang (*G. E. Bryant*, Feb.).

This little species is about the size of *C. lutea*, but much shorter and more globular in shape, dark-coloured and clothed with shorter pubescence, which however is less fine than in *C. ovalis*. The sides of the prothorax are regularly rounded and slightly serrated and the lateral margins broad and parallel. The discoidal part of the pronotum is strongly convex and deeply excavated at the sides and the basal stria is deep and not very close to the basal margin. The elytra are regularly punctured in rows. The legs and antennae are rather stout, the club of the latter nearly as long as the footstalk.

Chondria nitida, sp. n. (Plate I, fig. 5.)

Omnino castanea, nitida, postice breviter fulvo-setosa, modice elongata, fere oblonga; pronoti lateribus antice fortiter arcuatis, postice rectis, parallelis, marginibus antice latissimis, postice valde attenuatis, basi profunde sulcato; elytris leviter seriato-punctatis; antennis gracilibus, longitudine ad elytrorum longitudinem fere

acqualibus, articulis 2°–8° moniliformibus, similibus, 9°–11° ad hos conjunctos longitudine acqualibus, ultimo longe ovali.

Long. 2·5 mm.; lat. max. 1·5 mm.

Hab. Borneo, Sarawak: Quop (*G. E. Bryant*, March).

It is rather dark red in colour and very shining, with the pubescence short and scarcely traceable except upon the head and towards the extremities of the elytra. It is rather oblong in shape and the pronotum is broad in front and parallel-sided behind, with a deep basal groove not very close to the margin, and the elevated lateral margins very broad in front but considerably narrowed behind. The elytra are finely but distinctly seriate-punctate. The antennae are slender, with the 2nd to the 10th joints spherical, the last three large and the terminal one elongate-oval.

Probably in the quite fresh state the body is rather more hairy than in the unique type specimen, but this latter is otherwise in perfect condition.

Genus Ectomychus

Ectomychus monticola, sp. n.

Testaceus, clava antennali nigra, articulisque 7° et 8° infuscatis; oblongus, paulo depressus, setis pallidis erectis ubique vestitus; pronoto grosse haud crebre punctato, linea mediana fere laevi, lateribus abrupte sat late elevatis, marginibus horum interioribus carinatis, foveis basalibus profunde incisis, fere parallelis, vix ad medium attingentibus, marginibus exterioribus antice leviter arcuatis, postice rectis, angulis anticis paulo prominentibus, posticis rectis; elytris conjunctim latitudine ad prothoracem acqualibus, subtiliter sat crebre punctatis.

Long. 2–3 mm.; lat. max. 1 mm.

Hab. S. India: Nilgiri Hills (*H. E. Andrewes*).

This is the second described species of a peculiar genus, of which the elevated sides of the pronotum, as well as the hairy surface, indicate a relationship to *Stenotarsus*, but the antennae are markedly different from those of all other genera of the family hitherto described. There is no transition from footstalk to club, but the latter is very abrupt, and pectinate in form, its three joints being loosely connected at their outer sides, the two basal ones strongly

transverse and the terminal one almost circular. The prosternum is moderately broad between the front coxae and produced beyond them, truncate behind and overlapping the front part of the mesosternum, except when the body is fully extended. The exposed part of the mesosternum is strongly transverse and the metasternum is slightly emarginate at its junction with the mesosternum. There is a rather deep depression on each side of the metasternum behind the middle coxae and also a circular depression on each side of the first ventral segment behind the hind coxae. This segment is as long as the remaining four together and is very strongly punctured at the sides.

The pronotum is very coarsely and deeply punctured, of the breadth of the elytra at the base and not very strongly narrowed in front. The lateral margins are moderately broad and rather declivous, with their inner edges very sharply carinate. The elytra are much more finely and closely punctured than the pronotum, and have the shoulders slightly prominent. From the Japanese species (*E. basalis* Gorh.), previously described, *E. monticola* differs by its coloration, coarser puncturation and wider margins to the pronotum.

MIMOLITHOPHILUS, gen. nov.

Corpus oblongum, toto subiliter sat dense sericeum. Pedes modice robusti, femoribus haud clavatis, tarsisque haud brevibus, horum articulo primo sat longo, secundo anguste lobato, tertio parvo, ultimo gracili. Antennae breves, articulo secundo brevi, tertio fere ad duos sequentes aequali, tribus ultimis clavam angustam formantibus, ultimo oblique acuminato. Pronotum vix convexum, lateribus late elevatis, postice contractis. Elytrorum apices haud connati, separatim rotundati, abdominis extremitatem detegentes. Labium transversum, emarginatum; palpi labiales minuti, simplices: palpi maxillares robusti, articulo ultimo magno securiformi. Mandibulae apice bifidae, intus acute unidentatae. Oculi haud magni, grosse granulati.

Type, *M. brevicornis.*

This is a very peculiar and isolated genus. It is apparently a wingless form and the elytra, although long, are separately rounded at the end and leave exposed the extremity of the abdomen. The whole surface of the body, including the legs, is covered with fine silky hair.

The antennae are much shorter than usual in the Endomychidae, with the three-jointed club not much dilated, but the last joint strongly asymmetrical and pointed. The hind legs are stouter than the rest and all the tarsi are rather long, but the second joint is strongly lobed. The general appearance rather suggests that of *Lithophilus*, although the antennae are longer, the tarsi more lobed and the penultimate (third) joint more conspicuous. The pronotum has very broad raised margins, as in *Stenotarsus*.

Mimolithophilus brevicornis, sp. n.

Fusco-brunneus, antennis, pedibus, pronoti et elytrorum lateribusque rufescentibus, ubique dense punctulatus et sericeus; oblongus, depressus, capite sat longe fulvo-pubescenti; pronoto dimidio latiori quam longiori, marginibus fortiter elevatis, lateribus antice arcuatis, postice contractis, angulis anticis prominentibus, haud acutis, posticis obtusis; elytris longis, fere parallelis; antennis longitudine fere ad pronotum aequalibus.

Long. 6 mm.; lat. max. 2·5 mm.

Hab. Natal: Estcourt, Malvern (*G. A. K. Marshall*, Sept. and Oct.).

This is the largest of the three species known to me. It is more elongate and parallel-sided than the other two, with the discoidal part of the pronotum smoother and the sides less contracted behind. The antennae are extremely short in relation to the size of the insect.

Several specimens were taken by Dr. Marshall.

Mimolithophilus capensis, sp. n.

Obscure rufus, dorsi medio obscuriori, corpore ubique coriaceo et dense subtiliter sericeo; oblongus, haud convexus, capite fulvo-pubescenti, pronoto antice dilatato, postice valde contracto, lateribus medio obtuse angulatis, angulis anticis prominentibus, haud acutis, posticis obtusis, marginibus lateralibus valde elevatis, disco intra margines excavato; elytris sat longis, lateraliter leviter arcuatis, humeris prominentibus; antennis quam pronoto paulo longioribus.

Long. 4·5 mm.; lat. max. 2·3 mm.

Hab. Cape Colony: Cape Peninsula (*K. H. Barnard*, July), Cape Town (*F. C. Purcell*).

This is smaller and more elongate than *M. brevicornis*,

with the upper surface a little more opaque but rather less sombre in colour. The antennae are relatively a little longer and the legs a little more slender. The pronotum is very strongly dilated a little in front of the middle and much narrowed behind, and the elytra are well rounded at the sides.

Of a third species I await further specimens for description on a later occasion.

Genus Periptyctus.

Periptyctus eximius, sp. n. (Plate I, fig. 4.)

Ferrugineus, pronoti macula utrinque antica, elytrorum humeris, tibiarum dimidio inferiori tarsisque pallide flavis, pronoti medio et parte postica, utriusque elytri medio clavaque antennali infuscatis (sed hujus apice pallido); breviter ovalis, convexus, glaber; pronoto parce sat profunde punctato, utrinque late excavato, marginibus lateralibus haud latis, leviter arcuatis, angulis posticis acutis; elytris brevibus, striato-punctatis, punctis numerosis, distinctis, parum regularibus, humeris bene elevatis; antennis gracilibus, clava laxe articulata, articulo ultimo longe ovali.

Long. 3 mm.; lat. max. 2 mm.

Hab. New S. Wales: Illawarra (*G. E. Bryant*, Oct.).

Two specimens without apparent sexual difference.

Although much larger than the typical species, *P. russulus*, and differing from it considerably in shape, this species has all the peculiar structural features of the genus. It is a much shorter and more convex insect, very shining but with well-marked punctures upon the elytra, forming rather broad irregular longitudinal lines.

The sides of the pronotum are more broadly concave than in *P. russulus*, the elevated lateral margins a little narrower in proportion and the sides more gently and uniformly curved. The elytra are relatively very short, with the shoulders very prominent and the curvature of the sides continuous with that of the sides of the prothorax. They are also much more convex and more pointed behind than those of *P. russulus*. The antennae are long and slender, with a loosely jointed club. Although a broader insect the prosternum is rather narrower than in *P. russulus*. The latter species was taken at Hobart by J. J. Walker.

Genus Endomychus

As Gorham has himself admitted (Proc. Zool. Soc., 1887, p. 650), the difference in the maxillary palpi upon which he based the genus *Cyanauges* (*Coenomychus* Lewis) is not a substantial one and that genus is insufficiently distinguished from *Endomychus*. He has rightly referred here *Mycetina limbata* Horn (which Cziki's catalogue has for no apparent reason placed in *Aphorista*), but is entirely wrong in uniting with it the insect he himself very cursorily described (Endomycici Recitati, 1873, p. 64) as *Endomychus 4-punctatus*. That species, omitted from the catalogue, is very like *E. coccineus* L., but of shorter form. The actual habitat of the species, the unique specimen of which is now in the British Museum, is uncertain.

Genus Eucteanus.

The British Museum is fortunate in possessing types of all the known species of this genus. The remarkable uniformity which exists in the colour and pattern has caused the number of species to be overlooked. Not only have *E. hardwickei* Hope and *E. coelestinus* Gerst., been wrongly united, but the specimens described by Gorham as *E. cruciger* and *E. dohertyi* consist in each case of two species. As Mr. Gorham has not confined himself to the selection of a single type of the species described by him, I have selected in these cases the specimens from which the figures accompanying his descriptions have been drawn. *E. hardwickei* Hope differs from *E. coelestinus* Gerst. (the type of which has been acquired with the Gorham collection) by its longer antennæ, narrower club, more transverse pronotum and the markedly oblique position of the anterior elytral patches.

The genus consists of two very well-marked divisions, the first and typical one composed of species of elongate shape, in which the sexes are strongly differentiated, the males having the abdomen hollowed out beneath and the sides of the cavity elevated into very strong sharp-edged crests. The remaining species are short and broad in shape and the sexes are alike. The shape of the antennal club is as remarkable for its variation according to the species as is the elytral pattern for its constancy.

The following table gives the differential characters of all the species in a concise form.

A. Form elongate: abdomen of ♂ hollowed beneath.
  B. Elytra opaque.
    C. Club of the antenna narrow . . . *hardwickei* Hope.
    c. „ „ broader . . . *coelestinus* Gerst.
  b. Elytra shining.
    D. Humeral crests angularly prominent . *humeralis*, sp. n.
    d. „ „ not angularly prominent.
      F. Pronotum transverse . . . *cruciger* Gorh.
      f. „ not transverse . . . *vicinus*, sp. n.

a. Form rather short: abdomen of ♂ not hollowed.
  G. Club of the antenna short, broad and compact.
    H. Elytra widest before the middle . . *dohertyi* Gorh.
    h. „ „ behind „ . . *eucerus*, sp. n.
  g. Club of the antenna long and loose . . *marseuli* Gorh.

Eucteanus humeralis, sp. n.

Violaceus, elytris nitidis flavo-maculatis, maculis magnis, subrotundatis, prima humerali, paulo obliqua, secundaque subapicali ad margines intus et extus fere attingenti; elongatus, convexus, pronoto opaco, dense punctato, lateribus sinuatis, angulis omnibus acutis, productis; elytris sat fortiter et crebre punctatis, humeris angulatim prominentibus, apicibus opacis; antennarum clava laxe articulata, articulo ultimo paulo longiori quam latiori:

♂, pedibus omnibus quam in femina longioribus, tibiis leviter arcuatis, abdomine subtus fortiter bicarinato.

Long. 11–12 mm.; lat. max. 6 mm.

Hab. Burma: Haka, Chin Hills (*F. Venning*).

This has the form of *E. hardwickei* and *E. coelestinus*, as well as the angularly prominent crests at the shoulders, but it is rather smaller, the elytra are quite shining, except at their hinder extremities, and the club of the antenna is less dilated, more loosely articulated and more asymmetrical. The hind angles of the pronotum are a little more sharply produced. The coloration is practically the same as in *E. coelestinus*.

The male has the abdomen excavated in the same way, but with the lateral ridges more sharply elevated, and the tibiae are more regularly curved.

Eucteanus vicinus, sp. n.

Violaceus, elytris nitidis, utroque bimaculato, maculis magnis, pallide flavis, subrotundatis, ad margines internam et externam

fere attingentibus; elongatus, convexus, pronoto opaco, dense punctato, angusto, lateribus sinuatis, angulis omnibus acute productis; elytris sat fortiter et crebre punctatis, lateribus et apicibus opacis, humeris prominentibus, haud dilatatis; antennarum clava laxe articulata, articulo ultimo paulo longiori quam latiori:

♂, abdomine subtus fortiter excavato et bicarinato.

Long. 10–11 mm.; lat. max. 5 mm.

Hab. Assam: Manipur (*Doherty*).

The Museum collection contains one specimen of each sex, referred by Mr. Gorham to *E. cruciger*, but considerably smaller than the type (the specimen figured) of that species, from which it differs also in the narrower prothorax, with more sharply produced front and hind angles. The shoulders of the elytra are a little less prominent than in that species. The club of the antenna in both *E. vicinus* and *E. cruciger* is more abruptly dilated than in *E. hardwickei* and *E. coelestinus*, but much less so than in the *dohertyi* group. The ventral carinae of the male are very sharp and prominent.

The true male of *E. cruciger* is still unknown.

Eucteanus eucerus, sp. n.

Saturate coeruleus, elytris nitidis, utroque maculis duabus magnis subrotundatis ornato; parum elongatus, pronoti lateribus leviter bisinuatis, angulis omnibus acutis, vix productis, elytrorum humeris prominentibus, deinde ad post medium leviter ampliatis, apicibus paulo productis, haud acuminatis, separatim rotundatis; antennarum clava brevi, latissimo, articulo 9° vix dilatato, duobus ultimis late connatis.

Long. 8–9 mm.; lat. max. 5–5·5 mm.

Hab. Assam: Manipur (*Doherty*).

This is a member of the second group—of smaller and shorter-bodied forms. The elytra are smooth and shining, with the shoulders rather square (not broadly rounded, as in *E. dohertyi* Gorh.), the widest part beyond the middle, and the pattern consisting of four large rounded pale yellow patches, exactly as in *E. dohertyi* and *E. cruciger*. The antennal club is short, but larger and broader than in any other known species of the genus, the last two joints being very closely fitted together in the form of a triangle with almost uninterrupted sides, the preceding one only

very slightly dilated at the end. The club of *E. dohertyi* is of similar form but less dilated.

The two sexes are almost alike, but specimens with the abdomen more shining (that is, less closely punctured and hairy) and the 6th segment distinctly exserted are apparently the males.

Of the eight specimens mentioned by Gorham under the name of *E. dohertyi* six belong to the new species, the two from the Ruby Mines district alone agreeing with his figure.

Genus Bolbomorphus.

The new species of this genus described below is very interesting as a connecting link between *Bolbomorphus* and *Eucteanus*, indicating forcibly the non-significant character of the degree of dilatation of the antennal club, which has been treated as of primary importance in the grouping of the genera. In *Eucteanus* occurs the extreme degree of dilatation known in the Endomychidae (*E. eucerus* Arr.), while in the type-species of *Bolbomorphus* (*B. gibbosus* Gorh.) this feature is reduced almost to its minimum. In the second described species (*B. theryi* Gorh.) there is, according to the figure, a distinct widening, and in this (the third species) the antennae are in practically the same condition as in *Eucteanus hardwickei* Hope, the type-species of that genus, in which they exhibit their least developed phase in *Eucteanus*. In its general form *B. sex-punctatus* shows a close approximation to the smaller species of *Eucteanus* in which external sexual differences are absent, and indeed there is no important feature by which to distinguish them, so that we have a series of closely-related forms showing a complete transition in the shape of the antenna from one extreme to the other.

Bolbomorphus sex-punctatus, sp. n.

Brunneus, antennis nigris elytrisque punctis sex parvis flavis ornatis, duobus anterioribus transversim approximatis, externo post-humerali, fere ad marginem, tertioque subapicali remoto; ovalis, parum elongatus, pronoto sat parvo, fortiter punctato (lateribus subrugose), marginibus lateralibus bisinuatis, angulis omnibus acutis, basi haud marginato, medio laevigato, foveis basalibus brevibus; elytris valde convexis, nitidis, fortiter punctatis, humeris prominentibus; pedibus gracilibus, tibiis omnibus rectis, versus

apices paulo clavatis; antennarum articulis tribus ultimis valde compressis, primo elongato, ceteris latitudine fere ad longitudinem aequalibus.

Long. 8·5 mm.; lat. max. 5 mm.

Hab. E. China: Shanghai.

A single specimen collected by Fortune has been in the British Museum Collection since 1854. It appears to be a female.

The elytra are broader at the shoulders and rather less pointed behind than in *B. gibbosus* Gorh., and their convexity is less than in that species. The puncturation of the upper surface is stronger and closer, especially at the sides of the pronotum, which are densely punctured and opaque. The yellow spots are small and round, one placed just behind the shoulder and almost touching the lateral margin of the elytron, another near the last but just within and at the base of the shoulder prominence, and the third remote from these and considerably behind the middle of the elytron. The club of the antenna is very loosely articulated and dilates rapidly from base to extremity, where it is about twice as wide as in *B. gibbosus*.

Genus Milichius.

Thelgetrum of Gorham is synonymous with *Milichius*, *T. ampliatum* Gorh., being merely a little more elongate in shape than the other species so far known, and *Gibbiger* of Cziki, which has been separated solely on account of its thicker antennae, cannot be retained, for the proportions of those organs vary with every species. The genus accordingly contains at present six described species, to which several are added here. The genus appears to be Malayan in its distribution and is very well characterised by its hemispherical shape, long and narrow antennal club, widely separated coxae and broadly dilated basal joints of the feet. No sexual differences are known.

Milichius fuscipes, sp. n.

Laete flavo-rufus, laevissime aureo-micans, pedibus et corpore subtus infuscatis, tarsis rufis, antennis nigris, articulo ultimo pallide flavo; globosus, capite crebre inaequaliter punctato; pronoto minus crebre sed distincte punctato, lateribus leviter curvatis, antrorsum contractis, angulis anticis productis, rotundatis, posticis rectis, acutis, foveis basalibus brevissimis; elytris minute sat parce punc-

tatis, callis humeralibus prominentibus; antennis gracilibus, quam corporis longitudine parum brevioribus, articulis 2° et 8° latitudine ad longitudinem acqualibus, reliquis elongatis, tribus ultimis fere aequalibus.

Long. 4 mm.

Hab. Sumatra: Padang, Sidempoean (*Ericson*).

The type is unique.

The species is very closely related to the typical *M. nigricollis*, Gerst. It is bright ferrugineous red in colour, with the pronotum a little darker, the legs and lower surface very dark brown, with the exception of the sides and extremity of the body beneath, and the antennae black, except three or four basal joints, which are very dark brown, and the terminal joint, which is bright yellow. It might be regarded as a colour variety of *M. nigricollis*, but for the antennae, which are much more than half the length of the body, with joints 3 to 8 distinctly diminishing in length, the 8th about as wide as long. The puncturation above and beneath is as described for *M. nigricollis* Gerst. (which is unknown to me), but the basal foveae of the pronotum, although extremely short, are deep and broad.

Milichius politus, sp. n.

Lacte fulvus, antennis nigris (articulis 4 basalibus exceptis); globosus, glaber, nitidissimus, capite et pronoto minute sed distincte punctatis, hoc antrorsum valde contracto, angulis productis, haud acutis, lateribus arcuatis, foveis basalibus brevissimis, profunde impressis, elytris parce subtilissime punctatis, callis humeralibus prominentibus; antennis gracilibus, articulo 8° transverso, reliquis paulo elongatis, tribus ultimis longioribus.

Long. 4·5 mm.

Hab. Nias I.

A single specimen of this species, like many of the foregoing, formed part of the great collection made by the late Alexander Fry. It is bright orange-yellow in colour, with a very faint metallic golden lustre upon the elytra in a certain light. The antennae are black, except the four basal joints, and the last four ventral segments of the abdomen are paler than the rest of the lower surface, which, with the legs, is uniformly chestnut-red. There is a close resemblance to *M. fuscipes* but, besides the differ-

ently coloured antennae and legs, the puncturation of the upper surface is finer and more scattered, the front angles of the pronotum are rather less blunt and the antennae a little shorter.

Milichius apicicornis, sp. n. (Plate I, fig. 12.)

Ferrugineus, prothoracis lateribus callisque humeralibus paulo dilutioribus, antennarum articulis 5° vel 6° ad 10° infuscatis; subglobosus, nitidus, capite et pronoto modice punctatis, hoc antrorsum valde contracto, angulis productis, elytris fortiter modice crebre punctatis, callis humeralibus prominentibus; antennis sat gracilibus, articulis 2° et 8° longitudine ad latitudinem aequalibus, reliquis elongatis, tribus ultimis paulo longioribus.

Long. 3·5–4 mm.

Hab. Borneo: Sarawak (*G. E. Bryant*), Banjermassin.

A series of specimens were taken by Mr. Bryant in December and February upon Mt. Matang in Sarawak. It is an almost uniformly brown species, with the antennae black, except the basal four (sometimes five) joints and the terminal one. The sides of the pronotum and the shoulders of the elytra are rather vaguely paler. The upper surface is rather strongly punctured, especially upon the elytra. The pronotum is strongly narrowed in front and deeply emarginate to receive the head, with the front angles well produced. The humeral calli are very prominent. The antennae are rather less slender than those of *M. nigricollis*, but less compact than in *M. ferrugineus*. All the joints are elongate except the small 2nd joint and the 8th, which is about as broad as it is long. The last three form a scarcely perceptible club, the terminal one a little longer than the others.

Milichius brevicollis, sp. n.

Ferrugineo-rufus, pronoti medio elytrorum sutura et lateribus antennisque, apice extremo atque articulis tribus basalibus exceptis, infuscatis; subglobosus, nitidus, capite parce et subtilissime punctato; pronoto brevi, parce subtiliter punctato, lateribus leviter arcuatis, angulis anticis haud fortiter productis, late distantibus; elytris nitidis, sat fortiter, parum dense, punctatis, callis humeralibus modice prominentibus; antennis gracilibus, articulis omnibus elongatis, tribus ultimis longissimis, aequalibus.

Long. 4 mm.

Hab. Borneo: Pengaron (*W. Doherty*).

The type specimen is unique.

This species is closely similar to *M. apicicornis* and *biplagiatus*, but in addition to the slight difference in coloration it is rather more shining than the former, the punctures upon the elytra being a little finer and less close, the elytra are a little less broad at the shoulders, with the calli less prominent, and the prothorax is a little shorter, less deeply emarginate for the reception of the head, with the front angles less produced and farther apart. The antennae are slender, all the joints being distinctly elongate, the last three of equal length.

Milichius biplagiatus, sp. n.

Ferrugineus, nitidus, supra subtiliter metallicus, singulo elytro plaga obliqua parum distincta violacea ante medium ornato; subglobosus, capite crebre punctato, antennis vix elytrorum longitudine aequalibus, ferrugineis, articulis paulo elongatis, 3° quam 4° paulo longiori, 9°–11° majoribus, subaequalibus, pronoto irregulariter minute punctato, marginibus lateralibus sat late reflexis, postice fere rectis, angulis acutis; elytris sat fortiter punctatis, callis humeralibus prominentibus, minute punctatis, marginibusque distincte reflexis.

Long 4·5 mm.

Hab. Borneo: Pengaron (*W. Doherty*).

This also is described from a single specimen. It appears to resemble rather closely *M. expetitus* Gorh., from Sumatra, although differing in its feebly metallic rusty-red colour, paler at the front angles of the thorax and upon the humeral calli and with an ill-defined oblique blue patch behind each shoulder, as well as by its uniformly reddish antennae, composed of slightly elongate joints, the last three forming a narrow club and the terminal one only a little longer than either of the two preceding. The reflexed margins of the elytra are rather more prominent than in *M. apicicornis*, but less so than in *M. ornatus* Arrow, described elsewhere.

Genus Beccaria.

Beccaria sex-maculata, sp. n.

Nigra, nitida, pronoti angulis anticis late rufis elytrorumque maculis utrinque tribus discoideis, prima basali prope scutellum,

secunda ante medium prope marginem externam, tertiaque subapicali; hemispherica, capite subtiliter sat crebre punctato, pronoto ubique distincte punctato, lateribus densius, marginibus lateralibus leviter arcuatis, angulis anticis obtusis, posticis acutis, basi trisinuato, subtiliter marginato, foveis basalibus minutissimis; elytris ubique aequaliter sat fortiter punctatis; antennis modice gracilibus.

Long. 4·5 mm.; lat. max. 4 mm.

Hab. Malay Peninsula: Perak (*W. Doherty*); Borneo: Sarawak, Mt. Merinjak, 600 ft. (*G. E. Bryant*, May).

This species resembles *B. wallacei* Gorh., in which the elytra have each an additional red spot, but the puncturation is quite different in the present case, that of the pronotum much stronger and closer and that of the elytra very regularly and evenly distributed, without trace of linear arrangement. The basal foveae of the pronotum are much shorter and there is a fine marginal stria at the base which is absent in *B. wallacei*. The last joint of the antenna is a little longer than wide, and the two preceding joints are distinctly transverse.

Beccaria coccinella, sp. n. (Plate I, fig. 10.)

Nigra, nitida, prothoracis dimidio antico elytrorumque plagis magnis utrinque duabus rufis, anteriori lunulata, humerem includenti, posteriori subapicali, transversim rotundato, pedibus antennarumque articulis 2 vel 3 basalibus etiam obscure rufis; hemisphaerica, capite subtiliter sat dense punctato; pronoto ubique minute punctato, lateribus laevissime arcuatis, angulis anticis obtusis, basi trisinuato, foveis basalibus minutissimis; elytris ubique aequaliter distincte punctatis.

Long. 4–4·5 mm.; lat. max. 3·5 mm.

Hab. Borneo: Quop, W. Sarawak (*G. E. Bryant*, Feb. to May); Malay Peninsula: Perak (*W. Doherty*).

B. coccinella has a close resemblance to *B. sex-maculata*, but the whole anterior half of the pronotum is red and the two anterior elytral spots are fused into one. The puncturation of the pronotum and elytra is regular and distinct, without trace of lines of punctures upon the latter, but it is a little less strong and close upon the former, and the fine marginal stria at the base in *B. sex-maculata* is here absent.

The difference between the sexes appears very slight, the (presumed) male having the club of the antenna a very little broader and more compact and all the tibiae a trifle wider and more curved.

Beccaria laeta, sp. n.

Rufo-flava, capite, pronoti medio, elytris clavaque antennali nigris, utroque elytro aurantiaco-bimaculato, macula anteriori antemediana transversa, intus et extus ad margines haud attingenti, macula posteriori anteapicali, fere circulari; hemisphaerica, valde convexa, nitida, corpore supra ubique crebre punctato; pronoto modice brevi, subtiliter punctato, lateribus fere rectis, antice leviter arcuatis, angulis haud acutis, postice fortiter divergentibus, angulis productis, acutis, basi subtilissime marginato, trisinuato, foveis basalibus minutissimis; scutello subtilissime punctulato; elytris crebre sed fortius punctatis.

Long. 4·5 mm.; lat. max. 4 mm.

Hab. Borneo, W. Sarawak: Quop (*G. E. Bryant*, March).

Mr. Bryant found only a single specimen of this species, which is nearly related to *B. coccinella*, but a little larger, with the pronotum more finely, and the elytra more closely, punctured. The sides of the pronotum are much straighter, diverging strongly to the base, where the angles are sharply produced. The coloration is similar to that of *B. coccinella*, but the pronotum is dark in the median part and broadly yellow at the sides, and the anterior orange patch of the elytra is not produced towards the base, but forms a short transverse bar, broader at its inner end and gradually narrowing towards the side, which it does not reach. The posterior patch is rather more regularly rounded than in the other species.

Beccaria philippinica, sp. n.

Flava, capite, antennarum articulis tribus ultimis elytrisque fuscis, horum marginibus externis maculisque utrinque tribus magnis rotundatis flavis, macula mediana etiam communi rufa; late hemisphaerica parum nitida; capite breviter flavo-hirto, pronoto lato, fortiter sat crebre punctato, lateribus laevissime arcuatis, angulis anticis obtusis, posticis fere acutis, basi subtiliter marginato, foveis basalibus fere obsoletis; elytris aequaliter sat fortiter punctatis,

lateraliter bene marginatis; antennis gracilibus, articulo ultimo elongato.

Long. 5 mm.; lat. max. 4·5 mm.

Hab. Philippine Is. (*H. Cuming*).

The single type specimen has for more than three-quarters of a century passed unnoticed amongst Coccinellidae in the British Museum.

It is a prettily marked insect of a light chestnut colour, with the club of the antennae, the scutellum and the elytra dark brown, the latter having a large oval area upon the middle of the suture mahogany red and a narrow outer marginal border and six large round spots encircling the sutural patch deep yellow. These spots are placed exactly as in *B. sex-maculata*, from which the present species differs, in addition to the pale legs, antennae, thorax and margins of the elytra, by its more circular outline and wider pronotum. The 9th and last joints of the antennae are distinctly elongate and the 10th distinctly transverse.

Dadocerus, gen. nov.

Corpus angustum, convexum, glabrum, nitidum, pedibus longis, tarsisque simplicibus, 4-articulatis. Caput magnum, oculis prominentissimis. Antennae breves, cylindricae, 4-articulatae, clava fusiformi, articulis duobus elongatis quorum ultimo paulo longiori exstructa. Labrum latum, antice emarginatum. Pronotum transverse hexagonum, angulis anticis et posticis prominentissimis, dorso medio profunde sulcato. Elytra longi, singulum basi fortiter bicarinatum, humeris prominentibus. Mesosternum longitudinaliter carinatum.

Dadocerus nitidus, sp. n. (Plate I, fig. 11.)

Purpureo-castaneus, laevis, politus, pronoto transverso, antice lato, postice valde angustato, medio longitudinaliter sulcato, sulco bistriato, angulis omnibus lobatis, haud acutis; elytris valde elongatis, regulariter attenuatis, apicibus separatim rotundatis, humeris prominentibus, carinatis, carina retrorsum producta ad elytri partem tertiam, carina secunda interiori breviori striaque juxtasuturali fortiter impressa.

Long. 4·5 mm.; lat. max. 1·5 mm.

Hab. Borneo, Sarawak: Kuching (April), Quop (March).

Two specimens of this remarkable insect were found by

Mr. G. E. Bryant. Although very different in appearance from the genus *Trochoideus* it agrees with it in all the main details of its structure. The peculiar modification of the mouth-appendages is the same, as is also the conformation of the legs and lower surface. The most important difference is in the two-jointed club of the antenna, which is not consolidated but freely jointed, with the terminal joint only a little longer than the other. The whole surface is very smooth and shining and entirely devoid of hair above. The pronotum is about as long as it is wide at the base and deeply sulcate along the middle, with two fine parallel striae in the groove. The sides are nearly parallel in front, strongly retracted behind, the lateral margins depressed and a little thickened at the edges, and all the angles are produced into blunt lobes. The basal margin is also flattened and the basal foveae are close to the hind angles. The elytra are very narrow and taper from base to apex, with an entire lateral carina, giving rise at the shoulder to a short humeral carina. There is also a still shorter dorsal carina arising just behind the scutellum and a strongly impressed stria close to the suture. All the legs are long and slender, the hind tibia a little produced internally at the extremity.

The two specimens are probably males.

The common *Trochoideus desjardinsi* Guér., has been recently redescribed under the name *Pseudopaussus monstrosus* (Schulze, Phil. Journ. Sci. xi, 1916, p. 292).

Genus Exysma.

This genus is closely related to the European *Clemmus*, from which it differs chiefly in having only ten joints to the antenna. Two Japanese insects referred by Gorham to *Symbiotes* (*niponensis* and *orbicularis*) are entirely misplaced and are much more naturally placed in *Exysma*, as Gorham himself suggested. This entails renaming the Central American *Exysma orbicularis* Gorh., which may be called

E. spherica, nom. nov.

Idiophyes brevis Blackb., is another species of the same genus very similar to *E. niponensis* Gorh., but rather less strongly punctured, and with the elytra a little more produced behind.

Genus Clemmus.

For *Exysma parvula* Gorh., which has eleven-jointed antennae, Cziki has made another genus, *Parexysma*. Cziki, who evidently did not know the insect, his description being merely taken from that of Gorham, has separated it widely from *Clemmus*, with which in my opinion it should be united. The genus *Clemmus* is distinguished by the possession of three-jointed tarsi, but when carefully mounted and examined it becomes evident that the apparent basal joint consists really of two joints closely united, and it is very difficult to maintain any dividing line between this and closely allied forms in which the tarsi are distinctly four-jointed. There can be no doubt as to the very close relationship of Gorham's species to the typical *Clemmus troglodytes*, and another insect widely removed by Cziki, although also congeneric, is *Alexia ulkei* Crotch. Cziki's "Conspectus" of the Mycetaeinae contributes nothing to the elucidation of its subject. *Parexysma*, for example, having first been referred to the section characterised by the absence of a sutural stria is then particularly distinguished by the existence of such a stria.

Trichopsephus, gen. nov.

Corpus globosum, ubique setosum, pedibus tenuibus, tarsis filiformibus, quasi-triarticulatis. Prosternum productum, truncatum. Pronoti basis lobatus, marginatus, margo lateralis anguste incrassatus, medium linea incisa tenui transversa, retrorsum ad basin producta, proditum. Antennae tenuissimae, piliferae, 9-articulatae (♀) vel 10-articulatae (♂), articulo 1° longo, curvato, 2° minus elongato, tribus ultimis ovalibus, laxissime connexis, reliquis minutis, plus minusve elongatis.

This very remarkable genus was strangely overlooked by Gorham, who ascribed two species of it to different genera. The first, *Exysma tenuicornis* Gorh., may be regarded as the type of the genus. The other, from the island of Grenada, was called by him *Dialexia punctipennis*. The genus approaches *Micropsephus*, but has very strongly-marked peculiarities. The antennae are extremely slender, with a long curved basal joint, and the last three joints oval, almost alike, not large, but strongly differentiated from the rest in size and shape, clothed with bristling hairs and remarkably loosely connected with each other. The

pronotum has the lateral margins thickened and the base strongly lobed in the middle, with a marginal stria following its outline. This stria terminates at the basal impressions on each side, which have undergone a very curious modification, the two sulci meeting in the middle and forming a continuous fine stria more or less semicircular in shape. This, with the structure of the antennae, will lead to the easy identification of the genus.

T. ("*Exysma*") *tenuicornis* Gorh., was described from a single specimen from Guatemala. The British Museum collection contains also two specimens from Panama and one from Nicaragua (collected by Janson at Chontales) which I believe to be the female—indicating that both Gorham's species are based on characters of the male sex only. In the female the antennae are considerably less attenuated than in the male. The latter has joints 3 to 7 of extreme fineness, and the last three each drawn out at the base into a delicate footstalk by which it is attached, while in the female there are only nine joints, the first two as in the male, the 3rd and 4th short and minute, the 5th and 6th slender and the last three oval.

The species following is described from a female specimen agreeing in all essentials with that of *T. tenuicornis*, but with rather less slender antennae.

Trichopsephus niger, sp. n.

Niger, nitidus, totus parce griseo-setosus, capite, antennis pedibusque rufis, antennarum (♀) articulis 3° ad 6° fere aequalibus elongatis, tribus ultimis breviter ovalibus.

Long. 1 mm.

Hab. British Honduras: Rio Hondo (*Blancaneau*).

The two previously described species are red in colour, but the present one is shining black, except the head, legs and antennae. It is smaller than *T. tenuicornis*, but a little larger than *T. punctipennis*, and the antennae are rather shorter than in the same sex of that species, joints 3 to 6 being of almost equal length and the last three shortly oval.

Micropsephellus, gen. nov.

Corpus globosum, glabrum. Pedes graciles; tarsi filiformes, 4-articulati. Antennae 8- vel 9-articulatae, breves, articulis tribus

basalibus elongatis, 2 vel 3 sequentibus minutis, tribus ultimis magnis, haud laxe connexis. Pronotum absque lineis incisis, postice lobatum, margine laterali haud distincte elevata.

This genus is made for *Micropsephus hemisphoericus* Champ., and a new species, which differ from *Micropsephus* by their very short antennae and the absence of the impressed arched stria upon the pronotum, in the occurrence of which *Micropsephus* resembles *Trichopsephus*. The claws of the older genus are cleft, a condition which I believe has not hitherto been found in any other Endomychid genus, and the antennal footstalk consists of eight very stout and well-marked joints, but in the new genus these joints are very much reduced in size and development and number only five (in *hemisphoericus*) or six (in the new species).

Micropsephellus nigripennis, sp. n.

Lacte rufus, nitidus, elytris nigris; globosus, supra irregulariter haud crebre aut fortiter punctatus, pronoti lateribus antice incrassatis et excavatis; antennis 9-articulatis, tribus ultimis modice compactis, ultimo quam praecedentibus parum majori.

Long. 1 mm.

Hab. Antilles: St. Vincent, Leeward side, Kingstown; Grenada: Balthasar, Windward side.

Nine specimens were found by Mr. H. H. Smith.

In size and general appearance the species is exactly similar to *M. hemisphoericus* Champ., from which it is easily distinguished by its red head and thorax. It differs also in the peculiar thickening of the sides of the pronotum in front and in the smaller relative size of the terminal joint of the antenna, besides possessing an additional minute joint in the exiguous footstalk.

Parasymbius, gen. nov.

Corpus breve, latum, hirsutum. Pedes graciles; tarsi filiformes, 3-articulati. Antennae 10-articulatae, articulis tribus ultimis magnis, elongatis, laxe connexis. Pronoti latera aequaliter arcuati, antice et postice contracti, marginibus anguste incrassatis; foveae basales longae, basis fere rectus, sulco profundo, arcuato impressus.

This genus forms an interesting link between the New World *Bystus*, in which the antennae are 9-jointed, and

Asymbius, in which they are 11-jointed and of a highly peculiar development. *Parasymbius* has ten joints, forming a long and stoutly-made organ of which the three terminal joints are large, elongate and very loosely connected, but together not quite as long as the seven preceding joints, which are also elongate in gradually decreasing degrees, except the 6th and 7th, which are stout and quadrate. The legs are slender, the tarsi very long, filiform and quasi-3-jointed. The body is broad and convex, but not rotund, the pronotum being strongly contracted at the base, where the angles are rather obtuse and flattened at the sides. The lateral margins are very narrow, the basal impressions extend a little beyond the middle and are very broad at the base, where they are joined by a deep, curved basal stria. The whole upper surface is clothed with not very close soft yellow hair; the pronotum is smooth and shining and the elytra are rather strongly punctured, some of the punctures, which are a little larger than the rest, forming irregular and inconspicuous lines.

The only known species is the following, described from a single specimen in the British Museum.

Parasymbius philippinensis, sp. n.

Testaceus, antennarum articulis 7–9 paulo infuscatis; brevis, late convexus, pilis flavis haud longis aut densis vestitus; pronoto lato, lateribus aequaliter rotundatis, antice et postice contractis, basi fere recto, sulco posticali profundo, valde arcuato; scutello transverso; elytris convexis, latis, fortiter punctatis, punctis paulo majoribus nonnullis longitudinaliter ordinatis, lateribus undique fortiter et aequaliter arcuatis.

Long. 2·5 mm.; lat. max. 1·5 mm.

Hab. Philippine Is.: Isabela (*Semper*).

Genus Monocoryna.

This enigmatical genus, described by Gorham in 1885, has, perhaps wisely, not been included in the recent catalogue of Endomychidae. It has affinities with both the Endomychidae and Coccinellidae, and its most singular feature, the antenna, has a remarkable similarity to that of the Erotylid genus *Euxestus*, but it is an isolated genus in which the characters of neither family distinctly

predominate. The broad raised margin of the pronotum indicates its relationship to the present family, and there is also a peculiar structure, not hitherto noticed, on each side of the base of the pronotum, which may be homologous with the basal fovea so characteristic of the Endomychidae. Only a single specimen, now in the Genoa Museum, has been previously known, but a second species, of which there are two specimens in the British Museum, is now described.

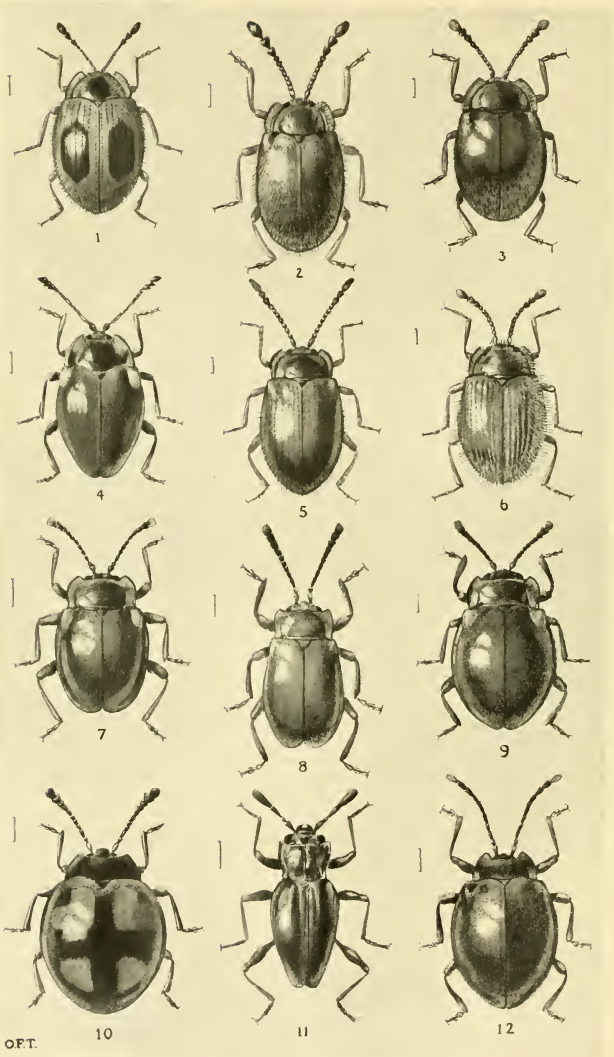
Monocoryna fasciata, sp. n.

Rufa, pronoto elytrisque nigris, illius plaga mediana et lateribus, horum fasciis undulatis tribus transversis, nonnunquam ad suturam interruptis, rufis; late ovalis, convexa, undique pube erecto brevi griseo vestita, supra irregulariter haud profunde punctata; capite utrinque longitudinaliter impresso; pronoto brevi, lateribus parum arcuatis, angulis anticis vix acutis, posticis late rotundatis, marginibus lateralibus late elevatis, his postice paulo intus productis e convergentibus, basi utrinque signa angulata parva inciso.

Long. 5–6 mm.; lat. max. 4–4·5 mm.

Hab. Malay Peninsula: Selangore (*H. N. Ridley*), Perak (*W. Doherty*).

I know the typical species of the genus (*M. decempunctata*) only from the published figure and description, but, although evidently related closely, it is very different in pattern and apparently more elongate in shape and more sparsely clothed with hair. *M. fasciata* is very broadly oval and highly convex and is entirely clothed with short erect grey pubescence. The head, lower surface, antennae and legs are red, with the large round club-joint of the antenna and the sides of the head darker. The pronotum and elytra are black, with the sides of the former red (except the extreme edges and sometimes the hind angles) and an arrowhead-shaped median stripe not quite reaching the base, an undulating transverse band upon the elytra just beyond the base, sometimes with an anterior offshoot cutting off the humeral callus, a similar band a little beyond the middle, sometimes interrupted at the suture, and an oblique mark on each side between the last and the apices, reaching the outer margins but not the suture, are also red. The upper surface is shallowly and irregularly, but rather



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coarsely, pitted. The head has a longitudinal curved stria on each side near the eye. The pronotum is short, with the sides feebly curved, except towards the hind angles, which are broadly rounded off. They have wide elevated margins, which are continued a little way round the base, tapering at the ends. On each side of the base at a short distance from the extremity of the lateral margin (*i. e.* in the position normally occupied by the basal fovea) is a very small but sharply defined triangular area.

Explanation of Plate I.

Fig. 1. *Chondria triplex*, sp. n., page 60.
2. *Stenotarsus malayensis*, sp. n., page 54.
3. *S. basalis*, sp. n., page 56.
4. *Periptyctus eximius*, sp. n., page 65.
5. *Chondria nitida*, sp. n., page 61.
6. *C. seriesetosa*, sp. n., page 58.
7. *Mycetina lurida*, sp. n., page 27.
8. *M. corallina*, sp. n., page 26.
9. *M. globosa*, sp. n., page 28.
10. *Beccaria coccinella*, sp. n., page 74.
11. *Dadocerus nitidus*, sp. n., page 76.
12. *Milichius apicicornis*, sp. n., page 72.

II. Pseudacraca eurytus hobleyi, *its forms and its models on the islands of L. Victoria, and the bearing of the facts on the explanation of mimicry by Natural Selection.* By G. D. Hale Carpenter, M.B.E., D.M., F.L.S., F.E.S., F.Z.S., Uganda Medical Service.

[Read November 5th, 1919.]

Plates II, III.

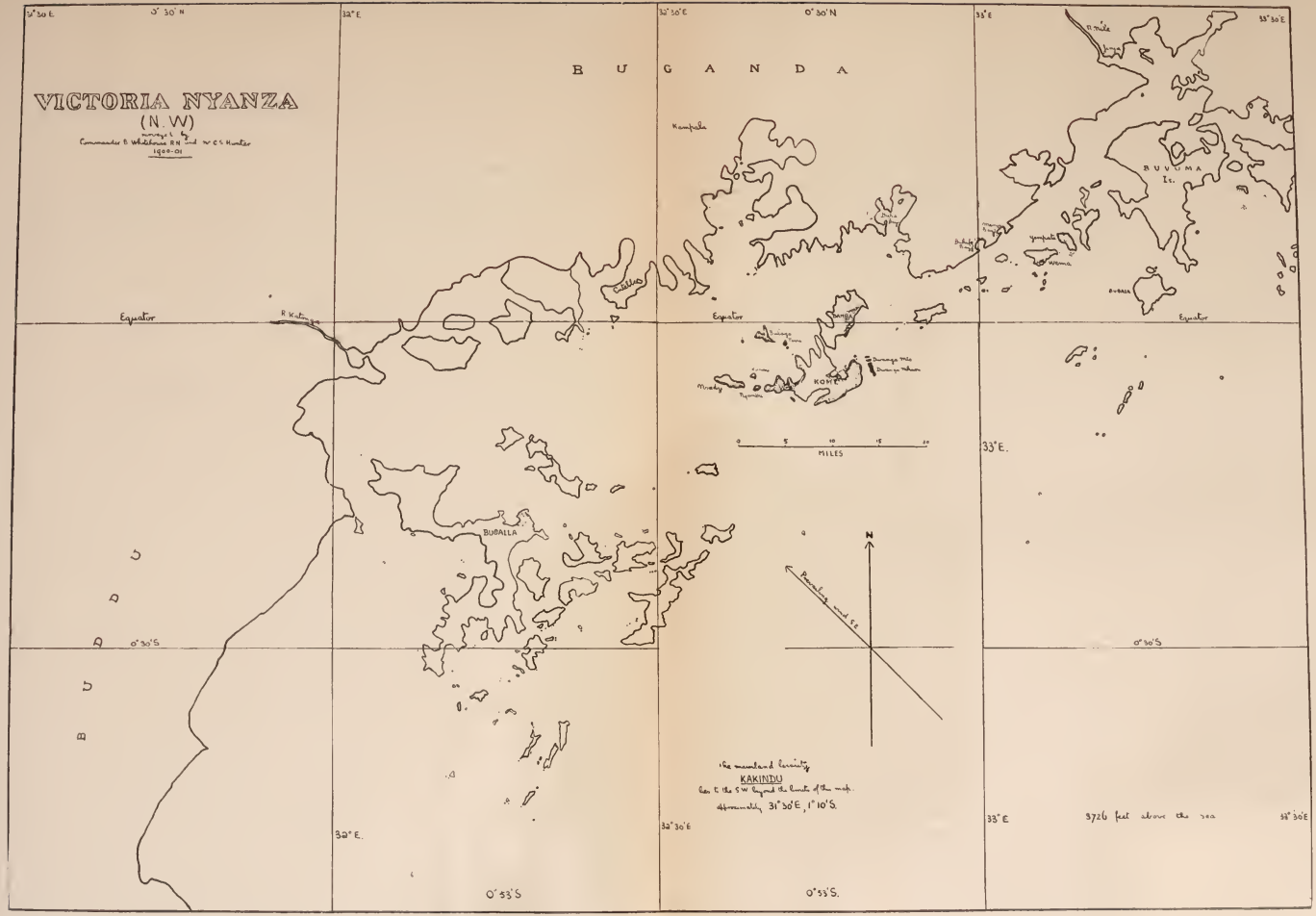
Forms of *Pseudacraea eurytus hobleyi* and its models were the subject of a paper which was communicated to the Society in November 1913, and was published in these Transactions, March 31, 1914, pp. 606–645.

The object of the paper was to show that with comparative scarcity of models on the islands, mimics which do not maintain the typically close resemblance are not destroyed by the action of natural selection (working, presumably, through vertebrate enemies), but are preserved; while in other places such as Entebbe on the mainland where models are more numerous than mimics the latter are kept true to type.

The explanation of the great number of varieties on the islands as compared with the mainland was first suggested to me by Prof. Poulton, as a result of a collection made on Damba island in 1911, which was described in Proc. Ent. Soc. 1911, pp. xci–xcv; 1912, pp. xxii–xxiii. Some of them were figured on Pl. xxxvi in the above-mentioned paper in 1914.

When I returned to the islands at the beginning of 1914 I went to a different group (see map), lying south of Entebbe and about twenty-five miles from it. Camp was pitched on the west end of the north shore of Kome, and the neighbouring small islands Bulago, Tavu, Ngamba, and Kimmi were frequently visited.

In August 1914 work was cut short by the call of active service, and during the rest of that year and in 1915 I was with troops on the Kagera river to the west of the lake. I spent many months at Kakindu (about 31° 30′ E., 1° 10′ S.), where was a fine forest known as the Tero forest, and here were obtained more specimens of the forms of *Pseudacraea eurytus* and their models.


VICTORIA NYANZA
(N.W)
Commander B. Whitehouse R.N. and Mr C.S. Hunter
1900-01
BUGANDA
BUDDU
BUVUMA Is.
Kampala
Equator
R. Katonga
BUDALLA
KOME
MILES
N
Prevailing wind S.E.
the mainland locality
KAKINDU
lies to the S.W. beyond the limits of the map.
approximately 31°30'E, 1°10'S.
3726 feet above the sea
32°E.
32°30'E
33°E
33°30'E
0°30'N
0°30'S
0°53'S

Lastly, after the signing of the armistice I was enabled to return to work on the islands, and went back to Kome in Dec. 1918, where I obtained more specimens from the same localities as in 1914, and also from the *eastern* end of the large island of Kome.

The specimens obtained from these localities have afforded most interesting and important data, exactly complementary to those in the earlier paper. The figures given in that paper may be here reproduced, together with the new data now discussed.

	Planema models.	*Pseudacraea* (all forms).
Mainland, 1909 (C. A. Wiggins, Entebbe)	252	88
Bugalla Island, 1912–13 . . .	129*	356
Kome and neighbouring islands, 1914 .	440	78
Mainland (Kakindu), 1915 . . .	102	13
Kome and neighbouring islands, 1918–19	39	55
Sundry other islands, 1918–19 . .	3	38

Study of the present data shows that :—

I. In 1914 on the islands *Planema* models were found to be very numerous and the *Pseudacraea* mimics less abundant and true to type, as in the Wiggins collection from the mainland.

II. On individual islands the predominant form of *Pseudacraea* was that which mimics the predominant *Planema* of that locality.

III. The collection from the Tero forest on the mainland (Kakindu) confirms the last result. In this locality the only abundant form of *Planema* was copied by the appropriate form of *Pseudacraea*, while only a single specimen of another form was taken.

IV. On the same islands in 1918–19, *Pseudacraea* was again more numerous, and more variable.

V. A collection from sundry other islands in 1918–19 contains ten times as many *Pseudacraea* as *Planema* models, nearly half of which are transitional.

The total numbers for 1914 are tabulated below for comparison with the Bugalla captures: the former are indicated by ordinary figures, the latter by Roman figures.

* The total was wrongly added up to 127 in the description of the table in the 1914 paper.

Combination.	Models.	Forms of *Pseudacraea eurytus hobleyi* Neave.	Other mimics.
I A.	*Planema poggei nelsoni* Grose-Sm. ♂ II. 23 ♀ 0. 11	♀ forma mimetica *poggeoides* Poulton. II. 0	*Ps. kuenowi hypoxantha* Jord. ♂ III. 0 ♀ VI. 0 *Papilio dardanus* Brown. ♀ f. m. *planemoides* Trimen. I. 0
I B.	*Planema macarista* ♂ E. M. Sharpe. X. 70	♂ f. m. *hobleyi* Neave. XXVIII. 19	*Acraea alciope* Hew. ♀ f. m. *aurivillii* Staud. XI. 3 ♀ f. m. *alicia* Grose-Sm. approaching typical western form (I). 0 non-mimetic ♂ (V). 0 *Precis rauana* Grose-Sm. ♀ XXIII. 1 non-mimetic ♂ (XXIV). (5)
II.	*Planema macarista* ♀ VII. 18 *Planema alcinoe cumerunica* Auriv. ♀ II. 33. not mimicked ♂ (VIII). (107) *Planema aganice* Hew. form *montana* Butl. ♀ 0. 49 not mimicked ♂ 0. (85)	♀ f. m. *tirikensis* Neave. XL. 17.	*Acraea jodutta* F. ♀ f. m. *jodutta* F. III. 2 non-mimetic ♂ (III). 4
		Forms transitional between ♂ *hobleyi*, ♀ *tirikensis*, and ♂ ♀ *obscura* Neave. ♂ XXIII. 0 ♀ XXII. 1	
III.	*Planema epaea paragea* Grose-Sm. ♂ XLI. 0 ♀ XXXIV. 0	f. m. *obscura* ♂ VII. 1 ♀ XIX. 3	*Papilio cynorta* Fabr. ♀ f. m. *peculiaris* Neave. ♂ 0. 0 Non-mimetic (I). 0
		Forms transitional between ♂ ♀ *obscura* and ♂ ♀ *terra* Neave. ♂ XXVI. 0 ♀ XI. 2	
IV.	*Planema tellus cumelis* Jord. (*platyxantha* Jord.) ♂ XXIV. 185 ♀ IX. 51	f. m. *terra*. ♂ LVI. 19 ♀ XLVIII. 16	*Acraea jodutta* Fabr. ♀ f. m. *dorotheae* E. M. Sharpe. VI. 4
		Forms transitional between ♂ ♀ *terra* and ♂ *hobleyi* and ♀ *tirikensis*. ♂ XXXVI. 0 ♀ XXXVIII. 0	
Totals	CXXIX. 140	CCCLVI. 78	

The tables on pp. 88–90 give the numbers of the various species which are the subject of the paper, together with others belonging to the same combinations.

It is hardly necessary again to go through the four combinations of models and their mimics, as these were classified in the former paper.

Some points especially worthy of notice may, however, be mentioned.

Combination I.—The chief mimic in this group, *Pseudacraea kuenowi hypoxantha* Jord., was not very abundant on Bugalla island, neither is it at Entebbe. But it is quite absent from the collections which are the subject of this paper. The Papilionid mimic, form *planemoides* of *Papilio dardanus*, was only taken at Kakindu during the period under discussion, where it was the commonest form of female. This and other mimetic Papilios from Kakindu will, I hope, form the subject-matter of a future paper.

Combination I B.—The form *hobleyi* of *Ps. eurytus* shows considerable variation in the amount of white and orange on the hind-wing. The model, ♂ *Planema macarista*, usually has some orange bordering the white, and is often copied in this respect by specimens of *hobleyi*.

Acraea alciope is scarcer in these collections than in that from Bugalla.

Combination II.—A new member of this combination was found in abundance directly I arrived on Kome in 1914, namely *Planema aganice* Hew., form *montana* Butl. The male of this handsome species does not enter into any of the mimetic associations now under consideration, but its female is of the same type as that of *Planema macarista* E. M. Sharpe, and is figured with it. It is a very remarkable fact that, although so abundant on Kome in 1914, this species was never captured on Damba in 1911, where I spent nine months, and first made the acquaintance of the fascinating *Planema–Pseudacraea* combinations. Damba on its western side is only separated from Kome by a narrow channel of a few hundred yards! (see map). Equally interesting are the facts that it was never seen on Bugalla during fourteen months' residence in 1912–13, and only *one*, a male, appears in the large Wiggins collection made at Entebbe in 1909. But on looking through a collection that I made a little way east of Entebbe on the north shore of the lake in 1910 (Buka bay, see map), I found several examples of *Planema aganice montana*.

	Mainland (C. A. Wiggins) Entebbe, 1909.	Bugalla island, 1912–13.	Kome group of islands, 1914.					Mainland (Kakindu), 1915.	Kome island, 1918–19.	Sundry islands, 1918–19.
			Kome.	Bulago.	Ngamba.	Kimmi.	Tavu.			
Planema poggei nelsoni . . ♂	13	2	18	1	2	2		4	1	
,, ,, ,, . . ♀	1		7	1	1	1	1	6		2
,, *macarista* . . . ♂	84	10	31	7	20	12				
,, ,, . . . ♀	39	7	13	1	3	1				
,, *alcinoe camerunica* . ♀	11	2	23	2	3	2	3	4	2	
,, ,, ,, . . ♂	31	8	83	15	4	2	3	1	1	
,, *aganice montana* . . ♀			11	14	17	6	1	1	1	
,, ,, ,, . . ♂	1		24	20	23	17	1			1
,, *epaea paragea* . . ♂	12	41						10		
,, ,, ,, . . ♀		34						6		
,, *tellus eumelis* . . ♂	78	24	184	1				27	21	1
,, ,, ,, . . ♀	14	9	51					44		
Acraea alciope, form *aurivillii* . ♀	51	11	2		1			6		
,, ,, ,, *alicia* . . ♀	2	1								
,, ,, ,, ,, . . ♂	39	5						7		
,, *jodutta*, form *jodutta* . ♀	47	3	2					9		
,, ,, ,, *dorotheae* . ♀	23	6	2		1	1		8		

Acraea jodutta chrysippus-like .	♀	4		1		1					
,, ,, ,, . .	♂	63	3	4				1	40		
,, *althoffi*, form *althoffi* .	♀	3									
,, ,, ,, *telloides* .	♀	8									
,, ,, ,, ,, . .	♂	14							1		
Pseudacraea eurytus, form *poggeoides*	♀	1	2								1
,, ,, ,, *hobleyi* .	♂	36	28	8		9	2		1	8	3
,, ,, ,, *tirikensis*	♀	33	40	8		7	2			5	8
,, ,, ,, *obscura*	♂		7	1						1	2
,, ,, ,, ,,	♀		19	1		2					2
,, ,, ,, *terra* .	♂	6	56	19					5	11	1
,, ,, ,, ,, .	♀	10	48	16					7	8	7
,, ,, transitional .	♂	1	85							13	7
,, ,, ,, .	♀	1	71	3						9	7
,, *kuenowi* . . .	♂	1	3								
,, ,, . . .	♀	1	6								
Precis rauana	♀	?	23	1					6		3
,, ,, ...	♂	?	24	2	3				9		
Elymnias phegea (white marked) .	♀	1									
Papilio dardanus, form *planemoides*	♀	6	1						10		
,, ,, ,, *niobe* .	♀	2							2		

? = number not given.

Date.	Locality.	Acraeine (*Planema*) models. I. A. *poggei nelsoni.* ♂	I. A. *poggei nelsoni.* ♀	I. B. *macarista.* ♂	II. *macarista.* ♀	II. *alcinoe camerunica.* ♂	II. *alcinoe camerunica.* not mimicked. ♀	II. *aganice montana.* ♂	II. *aganice montana.* not mimicked. ♂	III. *epaea paragea.* ♂	III. *epaea paragea.* ♀	IV. *tellus eumelis.* ♂	IV. *tellus eumelis.* ♀	Acraeine mimics. *Acraea alciope.* *aurivillii* mimics I. ♀	*Acraea alciope.* non-mimetic. ♂	*Acraea jodutta.* *jodutta* mimics II. ♀	*Acraea jodutta.* *dorotheae* mimics IV. ♀	*Acraea jodutta.* non-mimetic. ♂	*Acraea althoffi.* *althoffi* mimics II. ♀	*Acraea althoffi.* *telloides* mimics IV. ♀	*Acraea althoffi.* non-mimetic. ♂	Nymphaline mimics. *Pseudacraea.* *eurytus hobleyi.* *poggeoides* mimics I. A. ♀	*eurytus hobleyi.* *hobleyi* mimics I. B. ♂	*eurytus hobleyi.* *tirikensis* mimics II. ♀	*eurytus hobleyi.* *obscura* mimics III. ♂ ♀	*eurytus hobleyi.* *terra* mimic IV. ♂ ♀	*kuenowi.* mimic I. ♂	*kuenowi.* mimic I. ♀	*Precis rauana.* mimics I. ♀	*Precis rauana.* non-mimetic. ♂	Papilionine mimics. *Papilio dardanus merope.* *planemoides* mimics I. ♀	*Papilio dardanus merope.* *niobe* mimics IV. ♀	*Papilio cynorta.* *cynosta.* ♀	*Papilio cynorta.* *peculiaris* mimics III. ♀	Satyrine mimic. *Elymnias phegea.* mimics I.	Satyrine mimic. *Elymnias phegea.* mimics II.	Hypsid moth mimic. *Deilemera acraeina.* mimics II.
1901	Damba Is.	2	1	1	1					4		7		+	+							1	5	4	3	15			+	+							
																						10 transitionals															
1912–1913	Bugalla Is.	2	0	10	7	2	8			41	34	24	9	11	5	3	6	3				2	28	40	26	104	3	6	23	24	1						
																						156 transitionals															
1914	Kome group of islands	23	11	70	18	33	107	49	85			185	51	3		2	4	5					19	17	4	35			1	5							
																						3 transitionals															
1918–1919	Kome Is.	1				2	1	1				21											8	5	1	19											
																						22 transitionals															
1918–1919	Sundry islands		2						1			1										1	3	8	4	8			3								
																						14 transitionals															
1909	Mainland (Entebbe) C. A. Wiggins	13	1	84	39	11	31		1	12		78	14	51	39	47	23	63	3	8	14	1	36	33		16	1	1	+	+	6	2		+		1	+
																						2 transitionals															
1915	Mainland (Kakindu)	4	6			4		1		10	6	27	44	6	7	9	8	40			1		1			12			6	9	10	2	+				+
																						0 transitionals															

Sign + indicates present, but numbers not given.

According to Eltringham's "African Mimetic Butterflies" the typical *aganice*, in which the male is paler and the female has the white areas of smaller extent, is "confined to the Natal region, and is represented in British and German East Africa by the variety *montana*, which has a much wider range, being common in the Belgian Congo."

An interesting point is that in 1914 when visiting a group of islands east of Kome (Wema, etc.) this *Planema* was not noticed there.

But in 1919 when revisiting all the islands I had been to in '14, I found *aganice* on the Wema group. I am quite inclined to think that it had arrived there since 1914.

The ♂ of *Planema alcinoe* sometimes shows strong suffusion of the brown near the base of the fore-wing by a dusky hue. If this were accentuated a distinct approach to the pattern of the ♂ *aganice montana* would be produced. This point requires further investigation.

A very interesting member of Combination II is the large black-and-white Hypsid moth *Deilemera acraeina* H. H. Druce. This occurs at Entebbe, but I had never found it until I collected at Kakindu, so that it does not seem to have made its way to the islands. It was noted in my journal that "I saw it on the wing and took it for another ♀ *Papilio cynorta* Fabr., but realised after a little that there was something different. Its flight was not like that of any Hypsid I have seen before; much more floating and like that of the *Papilio*." *P. cynorta* ♀ is black and white, mimicking the ♀ *Planema epaea* of the west coast, which shows minor differences in its pattern from the *Planema* models of Combination II.

Another member of Group II, the black-and-white form of the Satyrine *Elymnias phegea*, which is not common at Entebbe, has never been met with on an island, nor at Kakindu.

Combination III.—The model, *Planema epaea* Grose-Sm., in its eastern form *paragea* was not taken on any of the islands discussed in this paper, although it occurs on Damba, which, as has been said, lies only a few hundred yards away from the eastern end of Kome. But several were taken at Kakindu, showing considerable variation. It is very interesting that at Kakindu *Papilio cynorta*, which was very abundant, was entirely of the *western* form, whose female mimics the black-and-white western form of *Planema epaea* which was not seen at Kakindu.

On the other hand, a few of the eastern form of the model, form *paragea*, *were* taken at Kakindu.

So here is an example of eastern (*Planema*) and western (*Papilio*) forms commingling on the western side of the great lake, while the form *peculiaris* Neave, of the *Papilio*, corresponding to the eastern model, did not occur.

Combination IV.—The form *dorotheae* of *Acraea jodutta* mimics *Planema tellus*, the model of this group. Another form is the black-and-white *jodutta*, belonging to Combination II.

A very interesting form has the subapical white bar on the fore-wing, but the other areas are of the rich orange of *dorotheae;* this corresponds to the more southern *esebria*, one of which was taken at Kakindu on 29.4.15. There is a very interesting similar variety of *Pseudacraea eurytus* transitional from *terra* to *hobleyi;* the likeness to the *Acraea* is remarkable, and the likeness of both to *Danais chrysippus*. A single ♂ of *Acraea esebria* was taken at Kakindu, of the same type as the last-mentioned form of *jodutta*. According to Eltringham this is "essentially a S. African insect" ("African Mimetic Butterflies," p. 81); it is considered by him to be distinct from *jodutta* although closely allied.

Acraea althoffi, of whose non-mimetic male a single one was taken at Kakindu, is of much interest since it has two forms of female which occur at Entebbe, but not in any locality where I have collected. These forms are secondary mimics in Combinations II and IV through the *jodutta* and *dorotheae* forms of *A. jodutta*, which are their primary models (Poulton, Report of 1er Congrès International d'Entomologie, 1911, pp. 504–506).

Transitional forms of Pseudacraea eurytus.—In the Bugalla collection of 1912–13 there were 85 ♂, 71 ♀ specimens showing a transition between the several named forms, out of a total of 356. In the collection from Kome, and the adjacent small islands lying off its western end, made in 1914, there were only 3 ♀ transitional forms out of a total of 77.

At Kakindu there were no transitional forms out of 13, which is not remarkable, seeing that all save one were of the form *terra*, corresponding to the predominant model. In 1918–19, however, on Kome island there were 22 transitionals out of a total of 52 *Pseudacraea*.

The proportions of *Pseudacraea* to *Planema* models in these localities are :—

	Wiggins coll. (mainland) 1906.	Bugalla (island) 1912–13.	Kome group (islands) 1914.	Kakindu (mainland) 1915.	Kome group (islands) 1918–19.	Sundry islands 1918–19.
Planema . .	252	129	440	102	39	3
Pseudacraea :						
(total) .	88	356	78	13	55	38
(transitionals)	2	156	3	0	22	14

Concluding Remarks.

These figures speak for themselves, and the specimens are in the Hope Department at the Oxford University Museum for any one to see.

It may be justly claimed that the results of recent collections are complementary to the former. That is, in the presence of greater numbers of models the mimics are found to be true to type, but when they outnumber the models many transitional and other varieties are found.

It was claimed in the previous paper that natural selection afforded the explanation, and this is further supported by specimens from Kome, Ngamba, and Kimmi islands and from Kakindu on the mainland (see map).

Locality.	Combination I.	Combination II.	Combination III.	Combination IV.
Pl.	56	47		235
Kome, 1914 *Ps.*	8	8	2	35
Pl.	23	23		
Ngamba, 1914 *Ps.*	9	7	2	
Pl.	15	9		
Kimmi, 1914 *Ps.*	2	2		
Pl.	10	5	16	71
Kakindu, 1915 *Ps.*	1			12

Kome is a large island and, like Bugalla, has forest along its shores and in patches on the high ground in its centre. Ngamba and Kimmi are quite small islands both covered almost entirely with forest. They are all so close together that it would be absurd to account for differences between the proportions of forms of *Pseudacraea* by climatic conditions. At Kakindu is a large area of forest at very little elevation above the lake level, extending from the lake shore five-and-twenty miles inland.

Now, on Kimmi the only *Planema* models in 1914 were the species with black-and-white females of Combination II, and the male of one of them belonging to Combination I. The only forms of *Pseudacraea* were *hobleyi* and *tirikensis* mimicking these combinations. On Kome the orange *tellus* of Combination IV predominated, and *terra* was the most abundant form of *Pseudacraea*.

On Ngamba, however, members of Combinations I and II were the prevailing models and the mimics were in proportions accordingly, to such an extent that just as *Planema tellus* appeared to be absent so was *terra* its mimic! But at Kakindu *tellus* was very much the most abundant, and all the *Pseudacraea* save one were of the corresponding form.

But the most remarkable feature of the collections now discussed is the difference between the proportions of models and mimics on Kome island in 1914 and 1918–19. On the former occasion 338 *Planema* models were taken, and only 56 *Pseudacraea*, of which only 3 were transitional: the proportion of model to mimic being 6 to 1. In 1918–19, however, 25 *Planema* models were taken but 55 *Pseudacraea*, of which 23 were transitional; the proportion of model to mimic being 1 to 2·2.

This most interesting result seems to fall in almost too well with the others! It is supposed that on an island such as Ngamba the insectivorous birds spare mimics in Combination II but destroy the rest, while on Kome and at Kakindu they find the model of Combination IV so much more abundant that its mimics are more often spared. This, of course, presupposes that the bird population of an island stays there, and that birds from Ngamba do not cross to Kome to hunt. Although this may seem an extravagant theory yet a tour among many islands in 1914 showed that the bird fauna of adjacent isles does differ, and I pointed out in 1918, in reply to some remarks

by the late Colonel Manders on this very subject (Proc. Ent. Soc., p. xciii), that there is sufficient difference in tone between the songs of individuals of the same species on separate islands to show that some birds at least do not roam from one to another, otherwise such insular variations would not be perpetuated. I refer especially to flycatchers (*Platystira* and *Tchitrea*), but it must be admitted that the bee-eaters *Merops* and *Melittophagus*, in particular the former, cross over quite wide areas of water.

In the case of Kome, however, we find a gradual decline in the number of models and increase in mimics, with a great proportional increase in the number of transitional forms.

The destruction of butterflies, so far as selective action is concerned, is held to be mainly the work of young birds, which have to learn what to eat and what to avoid.

A young bird in 1914 would have found so many models that any member of a combination would have been more likely to be the relatively distasteful Acraeine; thus the youngster would learn to leave that combination alone, while *Pseudacraea* not conforming to the combination would have been destroyed. As this bird grew older, however, it would have found the models becoming scarcer and scarcer, and one must suppose that in consequence the bird forgot what these models tasted like, so that in later years no form of *Pseudacraea* had much more chance of surviving than any other; thus transitional forms would begin to be preserved.

A young bird hatched in 1916 would have come into a world where *Planema* and *Pseudacraea* were in approximately equal numbers, and thus its value as a selecting agent would have been very limited. For it was just as likely to meet a distasteful model or a relatively edible *Pseudacraea*, which might have been either a close mimic or a transitional form. But as soon as *Pseudacraea* became *more* abundant than *Planema* the absence of selection would come into play with ever-increasing force and transitional forms would become abundant, perhaps only limited by the range of variation and their physiological fitness.

As to the reasons for the decline in numbers of *Planema* on Kome from 1914 to 1918 I can give no satisfactory suggestion. When I first went to Kome it seemed to me that abundance of food-plant might account for the

abundance of *Planema* there, as compared with Bugalla, where, for example, I never found the plant which I knew to be the food of *P. poggei*. But it is difficult to imagine that in four years the food-plants had *all* become scarce enough on Kome to cause so great a diminution in the numbers of *Planema*. It is more likely that parasitic enemies are the cause of waves of prosperity and decline as is known to be the case with so many species; an abundance of hosts one year produces an abundance of parasites which destroy so many hosts that they in turn diminish in numbers, after which the host again increases.

In conclusion I should like to express my great regret that the late Colonel Manders, who so strongly criticised my first paper, is no longer here to see the results of further investigation of these interesting *Pseudacraea*. One feels that his doubts as to the correctness of the explanation of mimicry by natural selection would have been still further shaken by the new facts brought forward in this paper.

I am indebted to my kind friend and mentor Prof. Poulton for much helpful advice in the preparation of the paper: the arrangement of the specimens for reproduction is due to him and Dr. S. A. Neave, to whom I am much indebted.

Explanation of Plate II.

Model species of *Planema* on the left; mimetic forms of *Pseudacraea eurytus* on the right, each opposite to its model. All figures are ⅔ natural size.

Fig. 1. *P. tellus*, ♀. Kome Isle. 12.viii.1914. Caught by "boy" at edge of forest.

2. *Ps. eurytus* f. *terra*, ♀. Damba Isle. 1–15.ix.1911. In jungle, east side.

3. *P. epaea paragea*, ♀. Bugalla Isle. 24.ii.1912.

4. *Ps. eurytus* f. *obscura*, ♀. Bugalla Isle. 18.ii.1912.

5. *P. macarista*, ♂. Entebbe. 15.viii.1910. Caught by one of Dr. Wiggins' "boys."

6. *Ps. eurytus* f. *hobleyi*, ♂. Wema Isle. 1.iii.1918. In jungle on south shore.

7. *P. macarista*, ♀. Kome Isle. 29.vi.1914. Edge of forest.

Acraeine models *Nymphaline mimics.*

1

2.

3.

4.

5.

6.

7.

8.

9.

10.

C. Knight del. et chromo. Hodgson imp.

MODEL SPECIES OF *PLANEMA* WITH MIMETIC FORMS OF *PSEUDACRAEA EURYTUS*

5/8 nat size

Acraeine models. Nymphaline mimics.

MODEL SPECIES OF *PLANEMA* WITH MIMETIC FORMS OF *PSEUDACRAEA EURYTUS*.

⅘ nat. size.

8. *Ps. eurytus* f. *tirikensis*, ♀. Bugalla Isle. 6.xii.1912. Edge of forest.
9. *P. poggei*, ♀. Bulago Isle. 15.iii.1914. Flying across open grass land.
10. *Ps. eurytus* f. *poggeoides*, ♀. 13.viii.1911. S. A. Neave, near west foot of Mt. Elgon, in strip of forest, height 3600 ft. above sea.

The specimens are arranged in geographical order from Uganda eastwards to Mombasa (Plate III) and then southwards.

Explanation of Plate III.

Model species of *Planema* on left; mimetic forms of *Ps. eurytus* on right, each opposite to its model. All figures are $\frac{3}{5}$ natural size.

Fig. 1. *P. aganice* f. *montana*, ♂. 11.vii.1914. Ngamba Isle, forest edge.
2. *Ps. eurytus* f. *rogersi*, ♂ (the type). November 1906. Caught by Rev. K. St. A. Rogers, Shimba, about 16 miles west of Mombasa, about 1200 feet.
3. *P. aganice* f. *montana*, ♀. 1.viii.1914. Tavu Isle, forest edge.
4. *Ps. eurytus* f. *rogersi*, ♀ (the type). 28.vii.1906. Rabai, about 14 miles N.W. of Mombasa.
5. *P. aganice* f. *nyasae* n. ♂. 13.vi.1913. S. A. Neave. Mt. Mlanje, Nyasaland, 3000 ft.
6. *Ps. eurytus* f. *mlanjensis* n. ♂. 11.xii.1913. S. A. Neave. Mt. Mlanje, Nyasaland, 3000 ft.
7. *P. aganice* f. *nyasae* n. ♀. 10.vi.1913. S. A. Neave. Mt. Mlanje, Nyasaland, 3000 ft.
8. *Ps. eurytus* f. *mlanjensis* n. ♀. 17.iii.1913. S. A. Neave. Mt. Mlanje, Nyasaland, 3000 ft.
9. *P. aganice*, ♂. 13.iv.1897. G. A. K. Marshall. Malvern, Natal, 700–800 ft.
10. *Ps. eurytus* f. *imitator*, ♂. 7.v.1910. Bred by the late A. D. Millar in the Durban district, Natal.
11. *P. aganice*, ♀. 22.iii.1896. G. A. K. Marshall. Malvern, Natal, 700–800 ft.
12. *Ps. eurytus* f. *imitator*, ♀. 20.iv.1910. Bred by the late A. D. Millar in the Durban district, Natal.

The specimens from Mt. Mlanje, Nyasaland, are of great interest as showing a local variety of the *Planema* with the pale areas on fore- and hind-wings larger than in the typical S. African form; this variety is faithfully copied by the local race of *Pseudacraea* which shows a beautiful transition between the typical Southern form *imitator* and the northern and most eastern of the forms of *eurytus*, namely *rogersi*, and also the Uganda and west-coast form *tirikensis*. In the female the white subapical patch on the fore-wing, larger than in typical *imitator*, is very like that in some of the specimens of *tirikensis* most resembling their model (*macarista*, ♀), in which the posterior end of the white fore-wing bar is suppressed (cf. fig. 7 and 8, Plate 11). On the hind-wing the Mlanje females have a much larger white area than do the typical Natal *imitator*, in this resembling the female *rogersi*. On the under surface of the hind-wing the Mlanje specimens, both ♂ and ♀, show a basal red patch which in shape and tint is transitional between the narrow but long purplish red patch of Natal *imitator* and the more triangular umber patch of *tirikensis*.

The general appearance of these forms is sufficiently indicated by the plates. I propose the name *nyasae* for the Mlanje race of *Planema aganice*, and *mlanjensis* for the corresponding form of *Pseudacraea eurytus*.

III. *Notes on the biology of some inquilines and parasites in a nest of* Bombus derhamellus *Kirby; with a description of the larva and pupa of* Epuraea depressa *Illig.* (= aestiva *Auctt.*: *Coleoptera, Nitidulidae*). By Hugh Scott, M.A., Sc.D., F.E.S., Curator in Entomology, University of Cambridge.

[Read February 4th, 1920.]

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I. Introduction.

The purpose of this paper can be gathered from the list of headings above. While working temporarily at the Imperial College of Science, London, I received from Miss L. E. Cheesman, on July 19, 1918, part of a nest of *Bombus derhamellus* Kirby, the "Red-shanked Carder-bee," containing a number of insects of more than one Order which are frequently found as inmates of humble-bees' nests (20). The nest had been sent to Miss Cheesman at the Zoological Society's Gardens from Hoo, near Rochester, and the species of bee was determined from some dead workers in the nest. The other inmates were living, and were as follows: (*a*) two larvae of *Volucella sp.*, which died without completing their metamorphosis; (*b*) several larvae from which adults of the Tachinid fly, *Brachycoma devia*, were bred; (*c*) pupae from which emerged a Phorid fly, *Aphiochaeta rata*, and a Braconid parasite, *Orthostigma pumilum*; (*d*) several larvae from which adults

of the Cryptophagid beetle *Antherophagus pallens*, were reared; and lastly, (*c*) numerous larvae of the Nitidulid beetle *Epuraea depressa* (= *aestiva*).

Thus, the portion of the nest sent to me contained a good selection of the inmates enumerated by Mr. F. W. L. Sladen in his book on "The Humble-Bee" (**20**, chap. iv). The one which he mentions first was, however, absent; namely, the humble-bee wax-moth, *Aphomia sociella*, to the attacks of which he states that *Bombus derhamellus* is specially liable. This insect may have been present in the parts of the nest which I did not see.

My thanks are due to Miss Cheesman, for giving me the material, to Mr. A. W. Rymer Roberts, for advice on several points connected with the description of the larva of *Epuraea depressa*, and to Mr. K. G. Blair, who took charge of the pupae of that insect for some time during my absence.

II. **Brachycoma devia** Fallen.

This Tachinid fly is stated to devour the bees' brood (**20**, p. 75). Four larvae were present in the nest, one of which was killed and preserved, while the other three pupated on or shortly before July 30, 1918. The puparia were kept through the winter in sand which was moistened periodically, the conditions being identical with those described below under *Antherophagus*. One adult emerged May 15–16, the other two May 18, 1919. Sladen writes that the adult flies emerge in two or three weeks. This probably refers to a summer generation; in my material the pupal stage lasted nine months and a half. Sladen also describes the puparia as at first yellowish-brown, afterwards dark red; my three examples are very dark. The determination of the fly was confirmed by Mr. C. J. Wainwright.

III. **Aphiochaeta rata** Wood *and its parasite* **Orthostigma pumilum** Nees.

I am indebted to Mr. J. E. Collin for determining this Phorid fly. Two puparia found in the litter of the nest were isolated, and adults emerged from them respectively Aug. 12, (♀), and some time between Aug. 18 and Sept. 1, 1918 (♀). A male of the fly was found alive in the nest, Aug. 16, 1918.

Dr. Keilin has not studied this species in particular,

but he considers that the larvae of *Aphiochaeta* and of *Phora* are in general saprophagous, feeding especially on dead insects and snails. There are several published records of their being bred from the bodies of other insects, but it is doubtful whether any of these were cases of true parasitism, and whether the insects from which they were bred were not already decomposing (**16,** pp. 61–62 and 79–80). Be this as it may, Mr. Donisthorpe has recorded the rearing of 4 examples of *Aphiochaeta rata* from larvae which came out of the body of a Clerid beetle, *Thanasimus formicarius*, taken in Sherwood Forest (**8**). He also found one specimen in an observation nest of *Formica exsecta* (**9,** p. 61; **10,** p. 280). Mr. Collin tells me that he has seen specimens bred from a nest of *Vespa norvegica* by Mr. C. Nicholson of Chingford in 1915.

From another puparium of the *Aphiochaeta*, found in the nest of *B. derhamellus* and isolated, there emerged some time between Aug. 18 and Sept. 1, 1918, a female of the Braconid (Alysiid) parasite, *Orthostigma pumilum*, determined by Mr. R. E. Turner. It has been bred from other Phoridae. The Cambridge Museum contains a series bred from puparia of *Aphiochaeta rufipes* Meigen, which were found in a vase in a house at Parkhead, near Sheffield, June 1910 (in this case the flies were identified by Mr. F. J. H. Jenkinson and the parasites by Mr. G. T. Lyle). T. A. Marshall (**17,** p. 373) mentions that the parasite was bred in multitudes from *Aphiochaeta rufipes* by Ratzeburg in 1840.*

IV. Antherophagus pallens.†

The only representatives of this Cryptophagid beetle found in the nest were three larvae, one of which was

* In 1919 these two species of *Aphiochaeta* were found frequenting the burrows of a solitary wasp, *Crabro cavifrons* Thoms., in an elm log at Grantchester, Cambridge. On Aug. 16 a ♀ *A. rufipes* was taken flying about the log. On Aug. 22 a ♂ *A. rata* was seen by Mr. C. Warburton to enter one of the burrows: it remained inside about five minutes and was caught on emerging. Mr. J. E. Collin determined both flies.

† Fowler refers to this species as "*A. pallens* Gyll." Ganglbauer (**12,** p. 704) gives "*pallens* Oliv.," adding references to Herbst, Erichson, Sturm, Thomson, and Reitter, but not to Gyllenhal. Reitter (Fauna Germanica, Käfer, iii, p. 58, 1911) also has "*pallens* Oliv." Gemminger and Harold (iii, 1868, p. 882) have "*pallens* Fabr.," and add references to Olivier, Gyllenhal, and Sturm. I have not tried to decide which is strictly correct.

killed and preserved; the other two excavated cells for pupation early in Aug. 1918, in which they remained as resting larvae all the winter, not pupating till late April or early May 1919, and emerging as adults late in May. Therefore, as far as could be ascertained, the resting-larva condition endured about nine months, while the pupal period occupied twelve days or more.

Detailed observations of wintering and pupation.—The following is a more detailed account of the behaviour of these two larvae. For several days they were observed wandering restlessly about the vessel containing the nest-fragments, as though seeking a place for pupation. Therefore on Aug. 8, 1918, they were isolated in a small glass vessel containing sawdust to a depth of about half an inch. The very next day both had excavated cells, one against the side of the vessel, the other in the angle formed by its side and bottom (cf. *Epuraea depressa*). As in the case of *Epuraea depressa*, the cells were not lined with any secretion.

In these cells the larvae remained the whole winter. The sawdust was slightly moistened about every second day. Ordinarily the vessel was only covered with fine gauze, but when its contents became very dry it was sometimes lightly covered with a glass cover for about 24 hours after moistening the sawdust, to allow the moisture to diffuse through the contents. The vessel had to be moved from one place to another several times, owing to my leaving London. It was kept in rooms where fires were only burning exceptionally, and under these conditions changes in the weather affected the behaviour of the larvae to some extent. At first they lay in their cells against the glass, but when a cold spell set in, they retired deeper into the sawdust, pushing sawdust between themselves and the glass, so that they were no longer visible through the sides of the vessel. They reappeared against the glass more than once in milder weather, but finally both disappeared within the sawdust for the greater part of the winter.

One larva was seen moving about in its cell from the time it excavated the latter (Aug. 9) till Aug. 13. After that it went further into the sawdust and reappeared several times, and was observed lying in several different positions. Sept. 5–11, it was in a nearly vertical position, and hind end upmost during part, if not all, of the time. Sept. 13, it had pushed the sawdust away and opened a wide cell against the glass again, and was lying therein head upwards, at an angle of about 45°. When last seen (Sept. 23) it was lying on its side, nearer the horizontal. Sept. 26,

half the cell was filled with sawdust, into which it had retired, and no more was seen of the insect till May 23, 1919, when the contents of the vessel were turned out. The insect then ran out actively as an adult male, dragging at the hind end of its body an exuvium, which proved, on being mounted in balsam, to be the cast skin of the larva, not of the pupa. I cannot say, therefore, at what date this larva pupated.

The other larva allowed more of its history to be followed. It, too, was moving about in its cell from the time when it excavated the latter (Aug. 9) till Aug. 14. Aug. 16, larva much contracted, lying on its ventral surface. Aug. 18–31, larva turning about, sometimes on its back, sometimes on its ventral surface. Sept. 2, sawdust pushed over glass, larva invisible. Sept. 6, larva visible again, contracted, lying on its back in a horizontal position. Sept. 10, moving actively about in its cell. Sept. 11 and 13, lying straight out on its ventral surface (weather very cold). Sept. 17 and 20, larva lying on its side. Sept. 23, larva lying on its back on the glass bottom of the vessel. Sept. 26 and 30, larva retired into sawdust and was hardly visible. Oct. 8, lying on its back. At the beginning of November it had withdrawn so far into the sawdust that it was not clearly visible through the glass, and after Nov. 15 it was not visible at all till Jan. 15, 1919, during a mild spell, when it was on its ventral side with head towards the glass, having turned completely round since the time when it was last clearly visible in the autumn. At this time (Jan. 15) it was quite clearly seen to be still a larva. The insect was then visible no more till May 10, when (after several warm days) it was seen to be a *pupa*, quite pale, with no dark pigment in its eyes or in any other part. The pupa was observed nearly every day, and moved convulsively when the vessel was placed in a strong light. May 14, pupa lying on ventral surface, eyes darkening. May 15, lying on its back. May 19, pupa on its back, eyes quite black, general colour yellowish. May 22, morning, the adult (a female) had emerged and was lying in its cell. On the evening of May 23 the contents of the vessel were turned out, and the beetle ran out actively, with its dark coloration well developed. Assuming, therefore, that the transformation from a larva had only recently taken place when the pupa was first seen on May 10, the pupal stage lasted 12 days at least, perhaps rather longer.

Occurrence of Antherophagus in bees' nests.—The occurrence of several species of *Antherophagus* in humble-bees' nests is well known. This is not only the case with the European forms, for Grouvelle (14) has described from

Java a species, *A. ludekingi*, 5 males and a larva of which were found in the nest of a bee determined as *Bombus eximius* F. Smith. There is reason to believe that the flower-haunting adults are transported to the nests by clinging to humble-bees. Perris (**19**, p. 75) recorded the capture, in the Pyrenees, of an example of *A. nigricornis* clinging to the antenna of a *Bombus montanus*; and more recently Trautmann has published (**21**) a note (which I have been unable to see) on "an extremely rare find: *Antherophagus nigricornis* Fabr. on a living humble-bee."

I did not obtain from observation any information as to the exact part played by *Antherophagus* in the economy of the nest. Perris (**19**, p. 76) considered that the larvae are scavengers, playing the same rôle in nests of *Bombus* that those of *Cryptophagus* spp. play in wasps' nests. Cottam (**7**) records three cases of the finding of *A. pallens* in nests of *Bombus muscorum* in Derbyshire, Cheshire, and Lancashire respectively; in one of these nests larvae as well as adults were discovered, and it is noted that the larvae were in old, empty, cells of the comb. Two of these finds were made in the month of August; the third, in which only adult beetles were discovered, was in May.

Descriptions of larvae of Antherophagus.—No description is given here of the larva of *A. pallens*, of which I was only able to preserve one example. The larva has been described and figured by Gernet (**13**, p. 7), who found larvae of this species in the middle of August 1860, in numbers in cells of *Bombus muscorum*; but with them no pupae and only one adult. Perris (**19**) describes the larva of *A. silaceus* Herbst; he found adults of that species, and larvae which he referred to it without hesitation, in a nest of *Bombus sylvarum*, 23, viii, 1875. The larva of the Javanese *A. ludekingi* is described by Grouvelle (**14**).

Annual cycle of Antherophagus.—Summarising all these records, it is seen that adults have been taken in a bees' nest in May, and that adults and larvae have been found in a number of nests in August. In none of these cases have pupae been found; probably pupation occurs in the soil near the nest. The behaviour of my insects, which wintered as resting larvae and underwent a brief pupal stage in early summer, may well indicate the normal cycle of the genus in temperate countries. Presumably these beetles are double-brooded, with a short summer generation intervening between the emergence of the adults

in May and the assumption of the resting condition by the larvae in autumn.

V. Epuraea depressa Illiger (= aestiva Linn.).*

Biological observations.—About 22 larvae of this Nitidulid beetle, of various sizes, were found in the nest, but no pupae or adults. A number of examples were preserved; the rest excavated cells and pupated in them before the middle of August. Several pupae were also killed and preserved. As far as I could discover, the pupa does not have the hind end of its body clothed in the cast larval skin, a feature the presence or absence of which Ganglbauer frequently mentions in his definitions of families (**12**). In two specimens which were isolated and closely watched, the pupal period lasted 8–10 days, and the adults remained in the pupal cells 11 or 12 days after the final moult, emerging from their cells at the beginning of September.

Fowler (**11**, p. 228) records a case of the rearing of this species which reads as though the adults did not emerge till the following spring: a nest of *Bombus lucorum* containing many larvae of *E. depressa* was placed in a tin, and a large number of the adult beetles were reared "in the following spring." My specimens, however, emerged the same season, and I do not think this was due to artificial "forcing," since the larvae of *Antherophagus pallens* discussed above were kept under exactly the same conditions, and did not pupate till the following spring. Possibly, in the case recorded by Fowler, the beetles really emerged in late summer or autumn, and lay dormant in their cells till the next year. The adults are commonly taken on flowers in spring, and on several occasions numbers of them have been found in humblebees' nests of the season. Perhaps the insect is double-brooded, the second generation passing the winter as dormant adults.

Detailed observations of pupation.—Some of the larvae were left in a large vessel containing some earth, and on Aug. 9 it was observed that certain of them were excavating cells in which to

* In the nomenclature of this species Grouvelle is followed (**15**, p. 111). Among British Coleopterists it is probably best known as *E. aestiva*; see Fowler (**11**, p. 228). Ganglbauer (**12**, p. 477) refers to it as *E. ochracea* Erichson.

pupate. Others were isolated in lightly covered glass vessels containing some litter from the nest and moist sawdust. Three of these excavated cells in the sawdust, in the angle formed by the sides and bottom of the vessel, so that they could be seen through the glass. The cells were not lined with any secretion.* Aug. 6, these three larvae were lying, slightly curved, on their backs in their cells. Aug. 7, larvae on their sides or on the ventral surface. Aug. 8, one had pupated: this pupa was killed and preserved. Of the other two larvae, one pupated during the night Aug. 9–10, the other between Aug. 10 and 12. The pupae lay at first on the ventral surface, but on Aug. 13 one, which had the dark pigment of the eyes already showing, had moved on to its side. I was absent from London from Aug. 17 to Sept. 1, during which time Mr. K. G. Blair kindly took charge of the pupae, and noted as follows:—both had the wings and jaws dark on Aug. 19; the beetles had emerged on Aug. 20 and 21 respectively, but were still in their pupal cells up to Aug. 31. On my return on Sept. 2 I found them out of their cells, walking about and readily "feigning death." They are both female.

Other records of occurrence in humble-bees' nests.—The record of many larvae being found in a nest of *Bombus lucorum* has been already mentioned (**11**). Sladen (**20**, p. 78, footnote) includes the species among the beetles found by him in nests of humble-bees. Tuck (**22**, 1896, p. 154) records it from nests of *Bombus agrorum*, *B. sylvarum*, and *B. latreillelus*, stating that he once took over 60 examples of the adult in a nest of the last.

Biological notes on other species of Epuraea.—*E. depressa* is not the only member of the genus taken from nests of Hymenoptera. Tuck (**22**) records *E. obsoleta* † from nests of *Vespa vulgaris*. Perris (**18**) states that the larvae of *E. obsoleta* Fabr., live in fermenting sap under the bark of pine and oak stumps, and that the majority pupate in the soil, but a few in the less sappy places under the bark. Perris and Tuck refer to the subjects of their respective observations by the same name. If their determinations

* The larvae of *Antherophagus* also made unlined cells in a similar situation. The angle of the glass was a favourite place for pupation with some larvae of *Necrobia ruficollis* which I had under observation; but their cells are lined. See Ann. Applied Biology, vi, pp. 101–115, 1919.

† *E. obsoleta* is considered by Grouvelle (**15**, p. 126) to be a synonym of *E. unicolor*, Oliv.

are correct, this species (*E. obsoleta*) occurs in very different habitats. Bagnall (2) found adults of *E. angustula* Er., frequently in the burrows of the Scolytid (Ipid) *Trypodendron* (*Xyloterus*) *domesticum*, and considers that the *Epuraea* preys on the bark-beetle. Bagnall also found (1) larvae pupae and adults of *E. parvula* Er. * in the fungus *Daldinia concentrica* on dead wood. Field coleopterists are of course familiar with the situations in which the members of this genus are to be found, but the precise facts of their natural history are not well known.

Food of the larvae of Epuraea depressa.—The only evidence as to the rôle played by the larvae in the nests of the bees is afforded by the remains of food in their alimentary canals. Such remains are visible in three larvae cleared by boiling in 5 % potash solution and mounted in balsam. Two have closely-packed masses of food in the hind part of the gut, the third has a mass between its mandibles. The bulk of these remains consists of mineral particles, frequently colourless. There are also many vegetable fragments, pronounced by an expert mycologist, Mr. F. T. Brooks, without doubt to be hyphae of fungi, perhaps of more than one kind: and numerous brown bodies which are almost certainly fungal spores. These objects indicate that the larvae play the part of scavengers. [Compare the view that the *adults* of *Epuraea angustula* are probably predaceous; see above.]

VI. *Larva of* Epuraea depressa. (Figs. 1–7.)

The larvae are in various stages of growth, and measure from about 3 to about 6 mm. long. The general colour is pale yellowish. In most respects the larvae agree with that of *E. obsoleta* as described by Perris (18), being characterised specially by the presence of numerous tubercles bearing flattened, spatulate, hairs, on the dorsal surface, and by having the spiracles situated at the summit of tubercular prominences. The following details are from the full-grown larva, though I have observed no structural differences between partly and fully grown examples.

Head (Fig. 2).—Dorsal surface presenting a closely dotted appearance under a high power; under a $\frac{1}{6}$-in. objective the dots, which are not indicated in fig. 2 A, are

* *E. parvula* is regarded by Grouvelle (15, p. 123) as a synonym of *E. rufomarginata*, Steph.

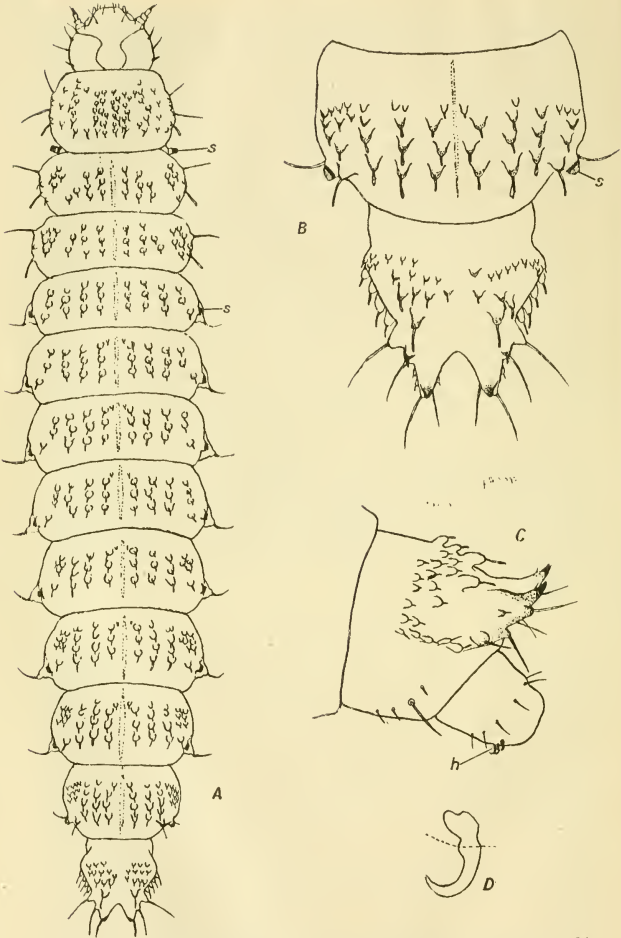

Fig. 1.—*E. depressa*, larva. **A**, dorsal view (legs not shown), × 24: *s.*, spiracles (only the thoracic and first abdominal are lettered). **B**, dorsal view of abdominal segments 8 and 9, × 56: *s.*, spiracle. **C**, 9th and 10th (anal) abdominal segments, lateral view, slightly tilted towards the observer, × 56: *h.*, pre-anal hooks. **D**, one of the pre-anal hooks, × 350. **A** and **B** are drawn from a specimen not cleared, but lying in spirit and viewed as an opaque object; **C** and **D** from a specimen cleared by treatment with caustic potash and mounted in balsam.

seen to be minute elevations in the chitin. On the front margin of the clypeus are 4 setae, the middle two shorter than the outer: just behind the front margin is a transverse series of 6 setae, the middle two shorter than the rest. The suture between clypeus and frons is very faintly indicated laterally, but obsolete in the middle.

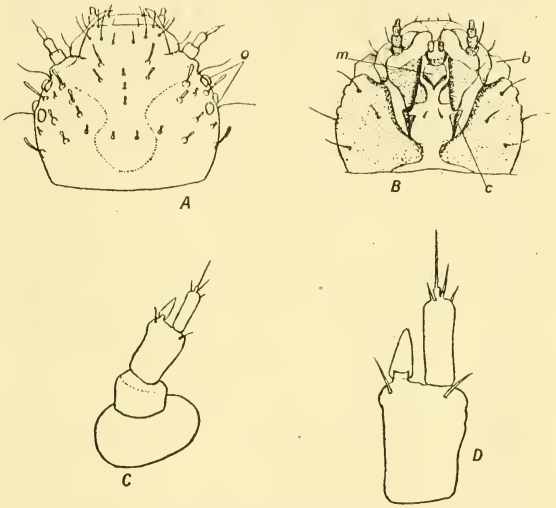

FIG. 2.—*E. depressa*, larva. **A**, dorsal view of head, × 56: *o.*, ocelli. **B**, ventral view of head, × 56: the more chitinised parts indicated by shading: *b.*, base of antenna; *c.*, cardo of maxilla; *m.*, mentum (?). **C**, whole antenna, × 170: basal segment somewhat collapsed in mounting. **D**, antenna, segments 3 and 4, and conical appendage on 3rd, × 350. **A** and **B** are drawn from a specimen not cleared, but lying in spirit and viewed as an opaque object; **C** and **D** from a specimen cleared with caustic potash and mounted in balsam.

There are several setae, near the middle line, in the frontal region. The epicranial suture is indicated in fig. 2 A by a finely dotted line. The vertex bears on either side a series of about 4 setae, commencing just behind the base of the antenna, and extending obliquely inwards and backwards: and a less regular series of about 3 just behind this. Most of these setae, especially on the posterior part

of the head, are flattened and spatulate, like those of the thoracic and abdominal segments, only narrower in proportion to their length. They require a high power for their exact discernment. Two long fine setae (not spatulate) project on either side from the outline of the head, one just behind the base of the antenna, the other further back; they arise from the lateral or ventro-lateral regions of the head. Two of the flattened hairs also usually project on either side. The position of the setae on the ventral parts of the epicranial plates is shown in fig. 2 B. *Ocelli*: 4 clear, round, colourless spots, raised above the surrounding surface, are visible under a high power on either side of the head; two, close together, immediately behind the base of the antenna; the other two, which are further apart, one being dorsal to the other, are further back. Perris speaks of 2 dark-pigmented ocelli on either side of the head in *E. obsoleta*: in *E. depressa* they are 4 on either side, and I have observed no dark pigment in them. *Antennae* (figs. 2 C, 2 D) 4-segmented, basal segment short, broad, soft, and pale (this segment has collapsed somewhat in the preparation from which fig. 2 C is drawn), second segment narrower but short, third about as long as the two preceding together, bearing at its apex a conical appendage, ventral to the base of the fourth segment: under a high power this appendage appears as a transparent cone with a short, narrow, neck at the base, where it seems to be doubled in on itself: fourth antennal segment narrow, with a long seta and several shorter ones at the apex.

Mouth-parts.—My study of these organs is incomplete, as I have been unable to devote sufficient time and material to elucidate fully the form of the hypopharynx and certain other points; nor is any attempt made to explain the homologies of all the structures described. Balsam-preparations of the whole head of three full-grown larvae have been examined, and in a fourth case the parts have been dissected and separately mounted. I have not dissected the mouth-parts of the youngest larvae, but from an examination of the underside of the head viewed as an opaque object, no structural difference from that of the full-grown larva is visible.

No structural *asymmetry* has been observed in the head or mouth-parts. Such asymmetry as appears in figs. 3 A, 5 A, and 5 B, is due to uneven pressure, or to the specimen

having moved into an oblique position with the drying of the balsam. This complete symmetry is in contrast to the condition existing in some beetle-larvae (e. g. *Dascillus* : see Carpenter and MacDowell, **5**, p. 381, etc.).

Labrum and epipharynx (Fig. 3 A).—The labrum is clearly separated from the head-capsule, the suture being represented in fig. 3 A by a sinuate, dotted line. Dorsally the labrum bears a rather long seta near either front angle : these setae are not shown in fig. 3 A, which represents only the ventral view. The front margin is nearly straight, and set with 4 short spines; between the median and outer spine on either side is a clear, circular, area, resembling a follicle from which the spine has been broken away, but this does not seem to be the explanation, as precisely the same arrangement has been observed in three specimens. At the sides the labrum is raised into lobes (cf. *Helodes* : see **5**, pl. 35, fig. 10), which (in the preparation from which fig. 3 A is drawn) project a little in front of the general outline of the margin, and the large lateral setae rise from behind (*i. e.* dorsal to) these lobes, apparently in the fold between the lobes and the general margin.* The inner margins of these lobes are closely set with hairs directed towards the middle line, and all the median part of the labrum is covered with minute prominences, some (or all) of which bear erect hairs : in the middle are 4 much larger round follicles. A pigmented, thickened, chitinous band, rather like a misshapen **W**, lies across the labrum, its median part bearing a transverse series of 4 rounded teeth; this is, presumably, part of the epipharynx (cf. *Helodes* : see **5**, pl. 35, fig. 10). No attempt is made to interpret the pigmented, thickened, chitinous parts (shaded in fig. 3 A) at the sides of the labrum near its base; nor the two curiously shaped pieces (fig. 3 A, *p.*) meeting in the middle line, and the greater part of which lies against the head-capsule behind the suture (fig. 3 A, *su.*) separating labrum from clypeus.

Mandibles (Fig. 3 B).—The upper *articulation* of the mandible is at a point on a level with the base of the antenna, but nearer the middle line, and is effected by a prominence of the head-capsule fitting into a hollow in the upper edge of the base of the mandible : this articu-

* Fig. 3 A shows 2 large setae on one side, 1 on the other. This asymmetry is accidental, or due to individual variation. A second specimen examined has 2 on either side.

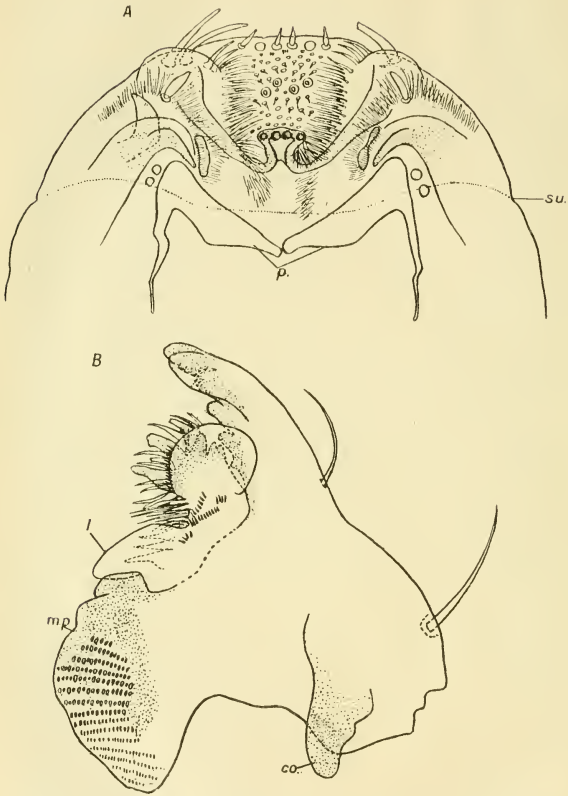

Fig. 3.—*E. depressa*, larva. **A**, labrum, epipharynx, and part of head-capsule from beneath, × 354; *su.*, dotted line indicating suture between labrum and clypeus; *p.*, chitinous pieces (see text). **B**, left mandible, ventral aspect, × 354; *co.*, condyle; *l.*, lanceolate portion of transparent lamina; *m.p.*, molar portion of mandible. Each is drawn from an example dissected out of a larva cleared with potash, and mounted in balsam.

lation is not seen in fig. 3 B. The lower articulation is brought about by the large condyle (fig. 3 B, *co.*) fitting with a point on the margin of the epicranial plate (post-gena ? : see fig. 2 B).*

The *apex* of the mandible is divided into 2 teeth, and there is also, along the upper (dorsal) edge of the apical portion, a series of 4 other teeth, that furthest from the apex being very small. *Molar portion* of the mandible large (fig. 3 B, *m.p.*), its inner surface (*i. e.* towards the middle line) raised into three blunt teeth (indicated in fig. 3 B, but in mandibles remaining *in situ* in the head, which lie in a slightly different plane, they appear much more marked). The molar part also bears a number of transverse series of very minute elevations; in fig. 3 B they are only shown on its ventral surface, but actually they extend round on to the dorsal side.

Between the apical and molar parts is a complicated set of structures, difficult to represent in fig. 3 B, as they lie one behind the other in several focal planes. Viewed from the ventral side there is towards the apex a thin transparent lamina with rounded outline, its margin set with long, sharp, prominences; this lamina is extended into another thin, transparent, broadly lanceolate part (fig. 3 B, *l.*) lying just in front of the molar portion of the mandible. Dorsal to the rounded lamina (seen partly through and behind it in fig. 3 B) is a number of stout, pigmented, finger-like processes, which appear to be grouped in several series, each at right angles to the plane of the figure. Below these, and between the rounded and lanceolate laminae, is a dense group of spines and bristles of differing length and thickness, and seen through the transparent lanceolate lamina is a series of sharp-pointed structures resembling long saw-teeth. The dotted line between the transparent laminae and the main body of the mandible in fig. 3 B represents the fairly clearly defined line at which the chitin becomes very thin and colourless. Possibly the whole of this complex structure corresponds to those parts or appendages, of very different forms, which have been described in the mandibles of a

* The words "upper" and "lower" are used here with reference to the actual position of these points in the larva. According to Comstock and Kochi (**6**, pp. 14, 37) the upper articulation is, from a strictly morphological point of view, really ventral, and the lower really pleural.

number of other Coleopterous larvae: *e.g.* the slender, movably articulated, tooth ("prostheca") in the mandible of *Dascillus cerrinus* (5, p. 382, pl. 36); the articulated comb-like process in that of *Helodes minuta* (5, p. 378, pl. 35); the "lacinia mobilis" in that of *Ochthebius* and *Hydroscapha* (3, pl. 18, figs. 9–12); the broad, thin, perlucid "retinaculum" in the mandible of the Coccinellid *Hyperaspis binotata* (4, p. 624, pl. 118, fig. 6); other examples doubtless could be cited.

Maxillae (Figs. 2 B, 4).—The lower parts of the maxillae and labium are so imbedded in, and continuous with, a transparent membrane, that it is not easy to delimit the parts exactly, and the boundaries are therefore sometimes represented in the figures by dotted lines.

The *cardo* (figs. 2 B, 4, *c.*) appears detached from the stipes in the figure, owing to the stretching of the membrane. On the inner side the limits between pigmented chitin and colourless membrane are not clearly marked. There is a longitudinal fold or thickening, and the posterior extremity apparently articulates with the tentorium (in fig. 2 B it appears to meet the margin of the epicranium, but is really at a deeper level, and is viewed through membrane).

The *stipes* is a large piece, passing gradually into membrane on the outer side; on the inner side there is at the base a projecting flange (fig. 4, *f.*), the flanges of the two maxillae nearly meeting in the middle line. The apical part of the stipes, from which the lobes and palp arise, is membranous (fig. 4, *mc.*) and transparent, and this part is sharply demarcated from the chitinised part, as shown in the figure; the membrane below the base of the palp is somewhat torn in the figured example, as is indicated by the dotted line. The dorsal surface of the stipes, between the bases of the lobes and the palp, bears spines and hairs, which, excepting those projecting beyond the outline between galea and palp, are not indicated in fig. 4. The apex of the larger lobe (*galea*) is set with ranks of processes, one behind the other, their apices blunt, bifid, and slightly curved over. The smaller lobe (*lacinia*) is presumably represented by the darker-pigmented, 3-fingered process (fig. 4, *la.*), which appears to be slightly curved round the lower edge of the galea. Its representation in fig. 4 is complicated by the presence of a number of spines (one of which is blunt and almost spatulate) on the dorsal side of

the galea. The *maxillary palp* is clearly 4-segmented, both in the full-grown and in the smallest larvae :—unless the

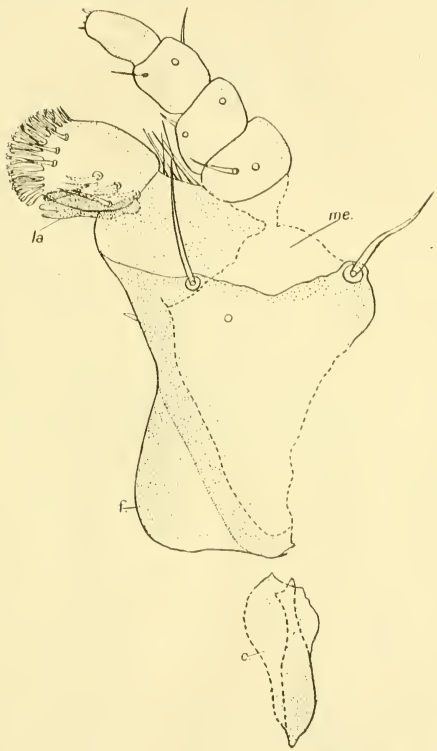

Fig. 4.—*E. depressa*, larva. Left maxilla, ventral aspect, × 354 : *c.*, cardo; *f.*, projecting flange of stipes; *la.*, lacinia; *mc.*, membranous part of stipes. Drawn from an example dissected out of a larva cleared with potash, and mounted in balsam.

part which I take to be the basal segment is really to be regarded as the palpiger, but it appears to have the character of a true palpal segment, while the palpiger may be repre-

sented by the membranous part, indicated as torn in fig. 4, beneath the palp. Perris (**18,** pp. 469, 471–2) regarded the palp as 3-segmented, therein disagreeing, as he himself states, with the descriptions given by some earlier writers of the larvae of certain other genera of Nitidulidae. If I am correct in regarding the palp as 4-segmented, this renders necessary a modification of Ganglbauer's general definition of Nitidulid larvae (**12,** p. 443).

Labium (Figs. 2 B, 5 A).—The apical part of the labium and the one-segmented *palpi* are shown in fig. 5 A. The apex appears feebly bisinuate, the margin set with very short hairs, and the median part of the surface also furnished with hairs. The folds and thickenings in the chitin are indicated by shading. The circular translucent spots on and below the palps resemble hair-follicles, but do not bear hairs in any of the 3 specimens examined. The irregular dotted line at the lower edge of the figure represents torn membrane. Below this are some complex chitinous pieces, not figured because it has not been possible to work them out fully in the material at my disposal: they may belong partly to the hypopharynx, which seems closely united to the labium at its base. Below the palp-bearing part of the labium is a roughly pentagonal chitinised piece (fig. 2 B, *m.*), its posterior margins darker-pigmented: if this is correctly interpreted as the *mentum*, then the *submentum* is membranous and transparent, and I have been unable to trace its boundaries, since colourless membrane extends right back between the stipites and cardines of the maxilla, and between the epicranial plates into the neck.

Hypopharynx (Fig. 5 B).—This organ requires for its complete elucidation more prolonged study than I have been able to give to it. It is not easily separable from the labium, and I am not certain whether fig. 5 B represents the whole organ, or whether the basal part broke away and remained attached to the inner face of the labium. The most conspicuous feature is the truncated, pigmented, chitinous tooth (fig. 5 B, *t.*), which, in balsam-preparations of the head with mouth-parts *in situ*, is seen projecting forward between the molar parts of the mandibles, reaching nearly as far as the front of these molar parts. Apparently the apex of the hypopharynx diverges considerably from the labium, so that the chitin-

ous tooth lies in a different focal plane, slightly *dorsal* to the molar parts of the mandibles; but possibly the latter come very close to it, or even work against it to some

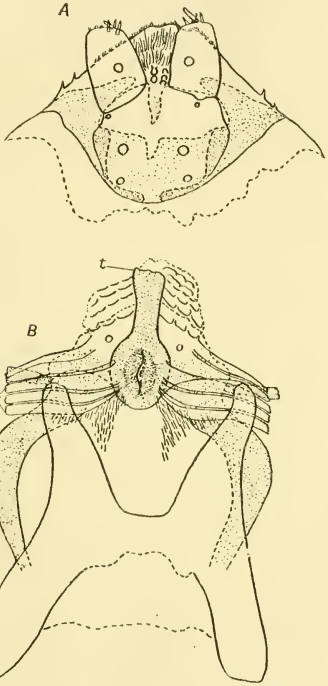

Fig. 5.—*E. depressa*, larva. **A**, apical part of labium, and palpi, ventral aspect, × 354. **B**, hypopharynx (? incomplete), × 354; *t.*, chitinous tooth projecting forward; *te.*, ends of 5 tendons. Each figure is drawn from an example dissected out of a larva cleared with potash, and mounted in balsam.

extent, when the mandibles are closed. Round this tooth is clinging some transparent membrane with torn edges and with a shagreened or scaley appearance. At the base of the tooth is a central chitinous body, oval in outline, from which arise on either side 5 tendons (fig. 5 B,

te.). The form of the chitinous pieces in the lower part of the hypopharynx is best seen from the figure, in which the more definitely pigmented parts are indicated by shading; their asymmetry is due to the organ having moved into a slightly oblique position as the balsam dried. They are connected by colourless membrane, the (torn) lower edge of which is indicated by the dotted line across the base of the figure.

Legs presenting no remarkable feature. They are terminated by a single claw, and closely resemble those of *E. obsoleta* as figured by Perris. They were bent under the body of the larva figured, and so are not shown in fig. 1 A.

Thorax and abdomen furnished dorsally with numerous small tubercles bearing flattened, spatulate, hairs, directed backwards: these hairs are described in detail below. In general the tubercles are arranged in 8 longitudinal series, 4 on either side of the middle line. Each series on any one abdominal segment (except the two last) usually consists of 3 larger tubercles, becoming gradually larger towards the hind margin of the segment, and one or more small tubercles at the front end of the series; the arrangement will be best understood from figs. 1 A, 1 B, and 7 A. On the three thoracic segments the series are less regular (see fig. 1 A): on the meso- and meta-thorax, and on the posterior abdominal segments, the front part of the outermost series tends to become a group, rather than a line, of small tubercles. *Prothorax* with 2 conspicuous setae on either side, *meso-* and *meta-thorax* each with one seta, rising from a tubercle, on either side (in each of the three thoracic segments one of the flattened hairs also frequently projects beyond the outline of the body on either side, and looks like an additional seta near the hind angle). Each of the first 8 *abdominal segments* has a large lateral setigerous tubercle in front of the hind angle. The form of the *9th abdominal segment* is best explained by fig. 1 A–C. *Anal segment* not normally visible from above, hidden under the 9th (shown in profile in fig. 1 C), bearing a transverse series of widely spaced setae, and a transverse row of about 5 *chitinous hooks*, directed forwards, immediately in front of the anus (fig. 1 C, D).

Spiracles (Figs. 1 A, 1 B, *s.*; 6 A, B) remarkable for being situated on raised tubercles, as described by Perris in the larva of *E. obsoleta.* The first pair larger than the others

and on longer tubercles, between the pro- and meso-thorax; the other pairs, on the first 8 abdominal segments, near the hind angles, just dorsal to the lateral setigerous tubercles. Pedunculate spiracles are also found in the larvae of certain other Nitidulids (**12**, p. 472) and in that of *Nosodendron* (**12**, pp. 445, 469, etc.), which, like many Nitidulid larvae, lives in running sap.

The apical part of each peduncle is chitinised and pigmented, forming a dark brown ring (fig. 6 A, B), within which, on the actual summit, is an area of pale membrane enclosing the spiracle itself. The latter is biforous, con-

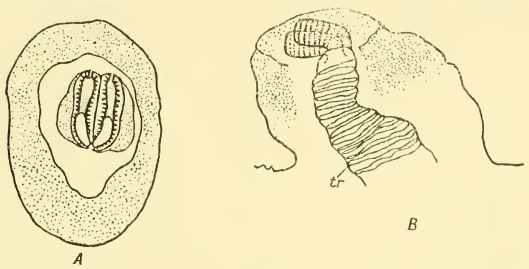

FIG. 6.—*E. depressa*, larva. **A**, spiracle between pro- and meso-thorax, in surface view, × 530: the outer shaded ring is the pigmented part of the apex of the tubercle; the unshaded area within this represents colourless membrane surrounding the spiracle itself. **B**, spiracle on 1st abdominal segment, × 530: shown in profile, partly in optical section, the pigmented band round the apex of the tubercle being left incomplete in front; *tr.*, trachea. Both are drawn from a larva cleared with potash and mounted in balsam.

sisting of two contiguous chambers, the side walls of which present a transversely striated appearance, clearly seen in profile (fig. 6 B) and indicated also in surface-view (fig. 6 A). The chambers have a common partition wall, though in the position from which fig. 6 B is drawn (oblique profile) they seem to some extent separate. Their tops appear at first sight to be open as two long narrow slits, but on closer examination it is seen that the aperture is only at one end, and occupies less than half the length of the chamber, the rest of which has a thin unstriated roof. The two openings appear as though united at their bases into a single U-shaped orifice: but this union is only apparent, due to a sudden break or thinning in the chitin

of the chamber walls, the space being occupied by a narrow neck of thin membrane separating the two openings, as indicated in fig. 6 A. There is also a break in the thicker chitin of the rim of each chamber at the end remote from the aperture. The trachea is united to the chambers at the end beneath the orifices. No definite atrium has been discerned, the spiral thickening coming very close, if not right up, to the point of union with the two chambers. The thoracic spiracles are considerably larger than the abdominal, and differently orientated, though in their structure no difference from the abdominal spiracles has been observed; in the thoracic the two chambers lie in a vertical direction with the orifices at the ventral extremity; in the abdominal, the chambers lie nearly parallel to the long axis of the body (or slightly oblique, with the front end a little lower than the hind), and the orifices at the anterior end. This orientation is best seen in specimens not treated with potash, viewed as opaque objects. After treatment with potash, the thin membrane within the chitinous ring tends to collapse, so that the spiracle may appear to rise from the bottom of a shallow crater. No difference from those of the full-grown larvae was observed in the spiracles of the youngest examples, so far as could be seen by viewing the latter as opaque objects.

The spatulate hairs (Figs. 1 A–C; 7 A, B). General arrangement described above. In preparations in Canada balsam, under a $\frac{1}{6}$-in. objective, the hairs borne by the dorsal tubercles are seen to be flattened, transparent, spatulate, and of varying size and length. Fig. 7 A shows them in dorsal view. Fig. 7 B shows a series of the dorsal tubercles in profile; in optical section the cuticle appears much thickened in the region of the tubercles, which seem to be formed by the throwing of the cuticle into convolutions; the minute erect processes (fig. 7B, *pr.*) spring from the general surface of the cuticle. Even the long slender setae projecting from the sides of the head and body appear, under a $\frac{1}{6}$-in. objective, more or less flattened, so that the difference between them and the spatulate hairs seems to be one of degree only, not of kind. The spatulate hairs recall similar structures figured and described by Boving (3) as occurring on the hind margins of the segments in the aquatic larva of *Hydroscapha*.

The occurrence of these numerous tubercles and spatulate hairs can hardly be connected with life in bees' nests,

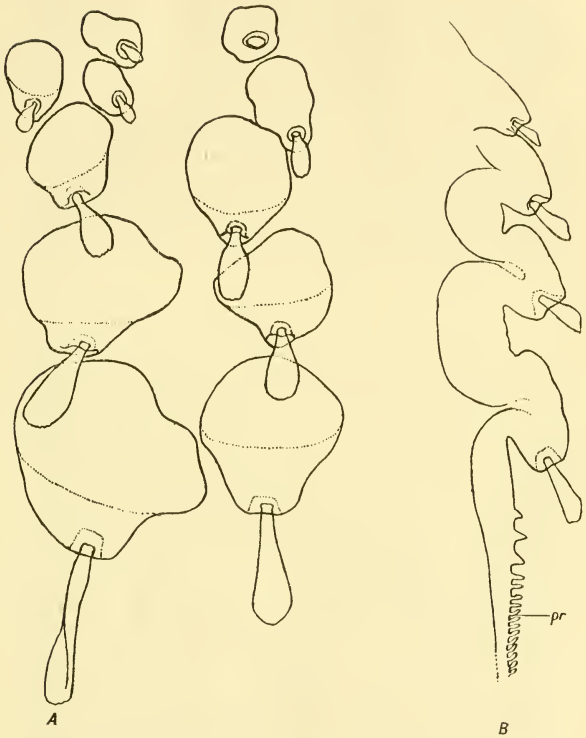

Fig. 7.—*E. depressa*, larva. **A**, two of the longitudinal series of tubercles and spatulate hairs on the 8th abdominal segment, dorsal view, × 350; the right-hand series in the figure is that immediately on the left of the middle line of the segment, and the two series are drawn exactly as they lie in relation one to the other: anterior end of series at top of figure. **B**, one of the longitudinal series on the 6th abdominal segment in profile, in optical section, × 350: anterior end at top of figure: *pr.*, minute erect processes of general surface of cuticle towards hind end of segment. **A** and **B** are drawn from two larvae cleared with potash and mounted in balsam.

since exactly the same structures, arranged in the same general way, are described by Perris in the larva of *E. obsoleta*, found under the bark of tree-stumps. Larvae of other Nitidulid genera bear dorsal asperities of various kinds.*

Comparison of larvae of E. depressa and E. obsoleta.—The larva of *E. depressa* agrees in most points with the description given by Perris of that of *E. obsoleta*. There are, however, some divergences. He describes and figures the meso- and meta-thorax of the latter as larger than the abdominal segments, which in *E. depressa* is not the case. My material also differs from Perris' description in the number of ocelli and the number of segments in the maxillary palpi, as stated above.

VII. *Pupa of* Epuraea depressa. (Fig. 8.)

Length (excluding the long spines at the front and hind ends) 3–3·5 mm. Whitish, not enclosed in a cocoon; furnished with a formidable armament of spines, which are rather broad at the base and taper to a very sharp point. The *head* bears two short, erect, spines, one immediately over each eye, and slightly curved backwards; these, of course, are not visible in dorsal view. The *prothorax* has two long, curved, forward-projecting spines on its front margin. On either lateral margin are 4 short spines; one on the part of the margin which curves downwards and inwards towards the eye (not visible in dorsal view), two others before the hind angle, and a fourth almost on the angle (these latter three are visible in dorsal view and shown in fig. 8 A). There are also two long, nearly straight, spines, erect and directed a little outwards, on the disc just before the hind margin. Each *leg* has a short, curved, spine at the knee-joint, on the apex of the femur; these are visible in dorsal view, since the femoro-tibial joints project beyond the outline of the body. *Abdomen*: the arrangement of spines is best shown in dorsal view. The basal segment bears none. Segments 2–8 have each two spines on either side, these

* The larva of *Pocadius ferrugineus*—the only other Nitidulid larva to hand for comparison—has 6 dorsal longitudinal series of setae, as well as setae on the lateral margins. Those of the two mid-dorsal series are borne in groups of three on tubercles. There is no modification of setae into flattened or spatulate hairs.

forming an inner and an outer longitudinal series; those of the outer series are larger, and become gradually longer from the 2nd to the 5th or 6th segment; they form the outline of the body when looked at dorsally or ventrally, and in ventral view appear to be processes of the lateral

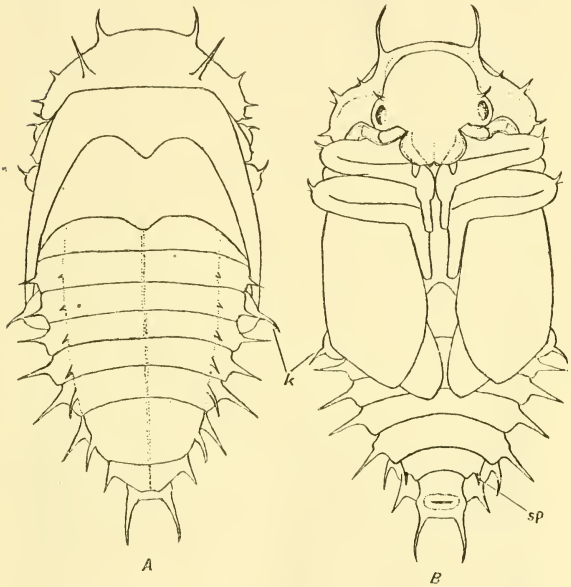

Fig. 8.—*E. depressa*, pupa. **A**, dorsal view, × 24: *k.*, knee-joint and spur of hind leg. **B**, ventral view, × 24: *k.*, as in **A**: *sp.*, 7th spine of the outer series, ventral in position and not visible from above. **A** and **B** are drawn from a single pupa, not cleared, but lying in spirit and viewed as an opaque object: the slight curvature of the pupa has caused it to appear a little longer in ventral view.

margins of the sternites; the seventh pair (*i. e.* that on the 8th segment) of this outer series is not visible in dorsal view, being ventral in position (fig. 8 B, *sp.*), and hidden by the overlapping of the spines of the inner series. The latter are very minute on the 2nd and 3rd segments, but become gradually longer on the posterior segments; they

are dorso-lateral in position until the 7th and 8th segments, where they form the lateral outline of the body viewed from above, and on the 8th segment conceal the spines of the outer series from dorsal view. In addition to these two series, there is a pair of long, curved, anal spines. Under a high power the spines on the knees and some of those on the prothorax were seen to bear a fine hair projecting from the outer side near the base. The mid-dorsal line of the abdomen, and the two dorso-lateral lines formed by the inner series of spines, are faintly marked by very slightly raised ridges in the cuticle, indicated in fig. 8 A by dotted lines.

Comparison with other Nitidulid Pupae.—Perris does not figure the pupa of *E. obsoleta* but describes it as having "des soies blanches" round the prothorax, on the sides of the abdomen, and on the knees. These are just the positions where the spines occur in the pupa of *E. depressa*, and I cannot help thinking that the pupa of *E. obsoleta* is probably closely similar, and that had Perris examined his pupae under a higher power, he might have described the processes as spines rather than as "soies blanches."

The only other Nitidulid pupa of which I have examined specimens is that of *Pocadius ferrugineus*. It has spines in the same situations as that of *E. depressa*, except that there are none on the head or knees, and those of the *inner* abdominal series are not developed on the first 6 segments. There are setae on the knees in exactly the same position as the spines of *E. depressa*. The spines in *Pocadius* are more slender and weaker: the terminal portion is simply a fine seta rising abruptly from the truncated stouter proximal part.

Perris also alludes to the cast larval skin clinging to the hind end of the abdomen of the pupa of *E. obsoleta*. As stated above (p. 105), this is not the case with any of my four pupae of *E. depressa* now, nor do I remember the larval exuvium being present when I placed them in spirit. Neither have I observed it attached to the pupae of *Pocadius*. Ganglbauer (12) gives the retention of this exuvium round the hind end of the pupa, or its absence, a rather prominent place in his definitions of certain of the Clavicorn families.

VIII. General Summary.

(1) In a nest of *Bombus derhamellus* received from Kent in July 1918 were the following insects :—

(*a*) larvae of the Tachinid *Brachycoma devia*, which pupated at the end of July, the adults emerging in May, 1919.
(*b*) puparia of the Phorid *Aphiochaeta rufa*, from which adults and a Braconid (*Orthostigma pumilum*) emerged in August, 1918.
(*c*) larvae of the Cryptophagid *Antherophagus pallens*, which passed the winter in cells excavated in sawdust, not pupating till late in April or early in May, 1919. The pupal stage occupied about 12 days.
(*d*) larvae of the Nitidulid *Epuraea depressa*. These pupated about the middle of August and adults emerged at the end of the month. The pupal stage lasted 8–10 days, and the adults remained in the pupal cells 11 or 12 days.

(2) The larva of *Epuraea depressa* is described for the first time. Only one other species (*E. obsoleta*) of the genus seems to have been described in the larval state. In both species the larvae are furnished with numerous longitudinal series of flattened, truncated, spatulate hairs, rising from tubercles on the dorsal surface. The larva of *E. depressa* has 4 ocelli on either side of the head; 4-segmented antennae with an appendage on the 3rd segment; mandibles furnished with a remarkable group of processes; maxillary palpi 4-segmented; labial palpi 1-segmented; spiracles pedunculate and biforous, one pair between pro- and meso-thorax, and 8 other pairs on abdominal segments 1–8 respectively.

(3) Larvae of *E. depressa*, after treatment with caustic potash, were found to have in the gut mineral particles, spores, and fragments of fungus-hyphae.

(4) The pupa of *E. depressa* is armed with spines situated on the head and prothorax, at the femoro-tibial joints of all the legs, and arranged in two longitudinal series along either side of the abdomen.

References.

The following is not intended to be an exhaustive bibliography of any of the matters dealt with, but merely a list of works to which it has been necessary to refer. Concerning the biology of *Epuraea* and *Antherophagus*, some of the references given below and certain others not included here will be found in M. Rupertsberger, "Biologie der Käfer Europas" (1880), pp. 128, 134; and in the same writer's "Die biologische Literatur über die Käfer Europas von 1880 an" (1894), p. 134.

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IV. *Notes on Fig Insects, including descriptions of three new species and a new Blastophagine genus.* By James Waterston, B.D., B.Sc.

[Read February 4th, 1920.]

The Imperial Bureau of Entomology has recently received a small consignment of Fig Insects from Uganda, collected by Dr. G. D. H. Carpenter. In working out these and other insects of the same family, already in the collections of the Bureau, I have made some notes which seem worth recording with the descriptions of the new species. Not the least interesting occurrence is that of *Blastophaga psenes* L. at Pretoria in 1919. One would like to know whether the species has been deliberately introduced or whether it has arrived more fortuitously.

Blastophaginae.

Blastophaga psenes L.

Cynips psenes Linné, Syst. Nat., p. 554 (1758).

Transvaal, Pretoria, 28.xi.1919. 3 ♀♀.

Compared with specimens from Montpellier (S. France) the above examples have the apical joint of the club a little shorter, and there are some minute differences in chaetotaxy which appear to be well within the range of variation shown in this species.

Blastophaga allotriozoonoides Grnd.

Blastophaga allotriozoonoides Grandi, Boll. Lab. Zool. Portici, x, p. 128 (1916).

Kabete, 27.vi.18. ♀ "Taken on coffee."

In this example the first joint of the mid tarsus is $\frac{1}{4}$ longer than the 2nd. In the head the length (depth) and width are sub-equal. The 2nd joint of the antenna is distinctly longer than wide. I have therefore assigned it to *B. allotriozoonoides* Grnd., though the shape of the scape does not quite tally with Grandi's figure (Bull. Soc. Ent. Ital., xviii, fig. 1, p. 6, 1917).

Genus Pegoscapus Cam. (1906).

Pegoscapus Cameron, Ann. Estacion Centr. Agronom de Cuba, p. 275 (1906).
Genotype *P. longiceps* Cam., *loc. cit.*, p. 276.

In "Genera Insectorum," 97, p. 386, 1909, Schmiedeknecht places this genus in the Spalangiini (Pteromalinae), but an examination of Cameron's material proves *Pegoscapus* to be a true Blastophagine. I have not had access to the original description, and cannot tell whether Schmiedeknecht has merely followed Cameron's opinion or puts forward his own views. The British Museum possesses two ♀ examples of *P. longiceps* labelled—

(*a*) "Cuba, ex Cameron Coll.," acquired in 1906.
(*b*) "Cuba, Havana, Baker, No. 3482, ex Cameron Coll. Type," acquired in 1914.

These specimens are specifically identical. The head is wanting in the type, but has fortunately been preserved in the co-type. The neuration is peculiar, being coloured up to the origin of the stigmal vein, beyond which is only a short hyaline stump along the costa, *i. e.* the postmarginal is practically, and without careful examination appears to be entirely, wanting. In this respect *Pegoscapus* Cam., approaches *Eiseniella* Ashm. (Proc. Wash. Ent. Soc., vol. 8, p. 31, 1906), which is a n.n. for *Eisenia* Ashm. (*nec* Malm. 1877) (Mem. Carn. Mus., 1, No. 4, p. 233, 1904). Should further investigation prove the identity of *Eiseniella* Ashm., and *Pegoscapus* * Cam., the former name will probably have priority, as it appeared on 13th July, while Cameron's paper presumably was not published till the end of the year.

The species next to be described is so remarkable that a new genus seems necessary for its reception. For this the name *Liporrhopalum*, gen. nov., is here proposed. Like *Blastophaga* Grav., *Liporrhopalum* has small circular abdominal spiracles, and the striae on the under surface of the mandibles and their appendages simple. There is a further agreement between the genera in the basal joints (1–5) of the antenna, but from the 6th joint to the end these organs in *Liporrhopalum* show affinity only with the genus *Agaon* Dalm. The neuration is unique, and in this respect *Liporrhopalum* has no close relation except with *Eupristina*

* cf. also *Valentinella* Grandi, Boll. Lab. Portici, xiii, p. 25 (1919).

Saund. In the latter, however, the only well-defined nervure is the submarginal, which ends in an indefinite club with 3 clear pustules, remote from the costa, towards which a linear thickening of the wing membrane stretches. This thickening is doubtless the obsolescent base of the marginal vein. In *Liporrhopalum* there is a single pustule towards the end of the submarginal, but the neuration is normal except that the radius is entirely wanting. The extreme tip of the neuration is abruptly thinned.

If the minute 4th antennal joint of this insect were overlooked, the antennal formula might be confused with that of the monotypic *Platyscapus* Motsch. (Bull. Soc. Nat. Moscou, vol. 36, p. 47, 1863), which was described from Ceylon and may be a Fig Insect. In his account of *P. frontalis* (*ib.*, p. 48, t. 2, f. 6), however, Motschulsky notes the presence of a short radius in the wings, and in the figure the funicle appears to be distally tumescent.

Liporrhopalum gen. nov. (Fig. 1.)

Head short, eyes large, sparsely subpilose. Antenna; scape broad and stout. Funicle slender, the joints from the 6th onwards several times as long as broad. Club long, cylindrical, not wider than the rest of the funicle. Sensoria short produced into long tubular processes. Thorax normal. Wings densely clothed with cilia. Neuration continued on to the costa, after a single pustule at the origin of the marginal. No stigmal vein. Spiracles small. Abdominal tergites not incised posteriorly.

Genotype the following species.

Liporrhopalum rutherfordi, sp. n.

A black or blackish-brown species, only the tarsi and mid tibiae paler. Wings hyaline.

Head between $\frac{1}{2}$ and $\frac{3}{4}$ broader than deep. Eye extending to half the depth. Antenna (fig. 1*a*) about 1 mm. long. Scape and bulla fused, broader than long (4 : 3). Apex of the former rounded, angulate above the pedicel, 4th joint minute and transverse (11 : 9), nearly completely hidden by the base of the horn-like process on the 3rd joint (fig. 1*b*). Sensoria on 5th joint of normal long Blastophagine type with short distal angular projections. Thereafter they are short with tubular processes. Relative lengths of the succeeding joints, 14 : 10 : 13 : 13 : 17, with an average breadth of 3. Both antennae are broken after the 5th. The last joint is

probably a fusion of two. If not, one joint may be missing. The apical sense organ shows a number of scale-like bristles disposed as in fig. 1*c*. Mandibular appendage short (measured along the inner edge sub-equal to the mandible along the outer edge), with 4 laminar ridges. On the under surface of the mandible between the ridge from the inner ventral tooth and the posterior edge there is only one median ridge. Pronotum undivided. Parapsides on

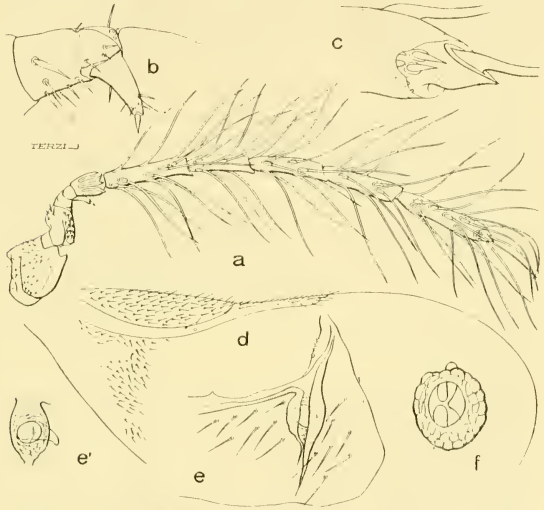


FIG. 1.—*Liporrhopalum rutherfordi* Wtst. ♀. (*a*) Antenna, (*b*) third joint of the same, (*c*) terminal sense organ, (*d*) fore-wing, (*e*) right side of propodeon flattened (dorsal and pleural aspects) showing partially covered spiracle, (*e'*) propodeal spiracle uncovered, (*f*) abdominal spiracle —6th tergite, on twice the scale of *e*.

outer half 7–9 bristles. Scutellum broadly overhanging. Metanotum 3–4 bristles on each side. Propodeon (fig. 1*e*).

Wings. Fore-wings (fig. 1*d*). Length 1·2 mm., breadth ·6 mm. The neuration extends to ·75 mm. from the radix. Rather over the distal $\frac{1}{3}$ (marginal + postmarginal) lies on the costa. Whole surface of wing densely pilose including the subcostal cell. Hind-wing length ·75 mm., breadth ·14 mm.

Legs. Apex of fore tibiae externally tridentate above, the corresponding ventral prolongation tridentate—the upper tooth

marginate. Apical spur simple, straight, more than half as long as the tibia. On the 1st tarsal joint posteriorly are 4–5 short stout bristles in a subventral row with as many more above. At the apex of the hind tibia ventrally on outer aspect are three connected curved teeth, the most ventral largest and covering the short peg-like spur. 1st hind tarsal joint ventrally gently excised and thinned on basal $\frac{2}{3}$. In the fore and hind tarsi the 2nd and 3rd joints are equal; in the mid tarsus the 3rd exceeds the 2nd by $\frac{1}{5}$. In the fore tarsus the 1st joint is $\frac{1}{2}$ longer than the 2nd; in the mid tarsus the first joint slightly exceeds the second and equals the third; in the hind tarsus the first joint is $2\frac{3}{4}$ the second.

Abdomen. Tergites 1–4 and again 5 and 6 are sub-equal, the latter distinctly shorter than the former. The receptaculum is globular and strongly chitinised. Spiracle small circular (fig. 1*f*), 7th tergite chitinised not membranous, stylet short broader than long, apically rounded with two long apical bristles and one at the side. Ovipositor about $\frac{1}{4}$ the abdomen, sheath with 8 bristles on apical half. Apex of saw with one rather strong tooth. 5th sternite not cultriform but rounded, truncated distally, with narrow central process.

Length, over 1·5 mm.

Alar expanse, about 2·75 mm.

Type ♀ in Brit. Mus.

Ceylon, Peradeniya. "On laboratory table," 1.viii. 1913. (A. Rutherford.)

Named in honour of its collector the late Government Entomologist at Peradeniya.

Although the following species is well marked, I feel a little doubt as to its generic position, owing to the incomplete state of the material available. All the specimens are dealated, and in none is an antenna complete beyond the 6th joint. While this does not prevent the drawing up of a reliable diagnosis a study of the wings and last segments of the antenna might have given additional clues to the generic placing of this form. From typical *Agaon* the new species differs only in having but one major tooth on the mandible. The head is also somewhat short. On the other hand, the antenna (fig. 2*b*) so far as it goes is exactly that of *Agaon* and of no other Blastophagine genus. Another slight but important character is the presence of a row of bristles (4) along the stipes and the absence of a palp-like splint. *A. scobiniferum*, sp. n., may

be known at once by the short and broad mandibular appendage.

Agaon scobiniferum, sp. n.

Head (fig. 2*a*) much longer than wide, across the eyes (5 : 4), at the mouth edge (2 : 1), about equal to the thorax up to the hind edge of the scutellum or to $\frac{2}{3}$ of the entire thorax and propodeon. Eyes small, prominent, occupying $\frac{1}{3}$ of the depth and separated by $\frac{3}{4}$ the greatest width of the head. Toruli set at $\frac{2}{3}$ from the base

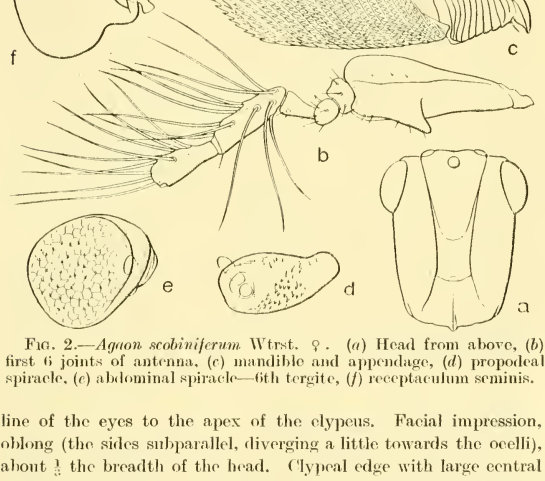


Fig. 2.—*Agaon scobiniferum* Wtrst. ♀. (*a*) Head from above, (*b*) first 6 joints of antenna, (*c*) mandible and appendage, (*d*) propodeal spiracle, (*e*) abdominal spiracle—6th tergite, (*f*) receptaculum seminis.

line of the eyes to the apex of the clypeus. Facial impression, oblong (the sides subparallel, diverging a little towards the ocelli), about $\frac{1}{3}$ the breadth of the head. Clypeal edge with large central tooth-like lobe flanked on each side by 2 bristles with 2 pairs of approximated bristles medianly set before $\frac{1}{2}$ towards the toruli. Mandibles (fig. 2*c*) with one apical tooth and (ventrally) 10–12 ridges. The serrated appendage a little more than twice as long as broad with about 20 rows of saws containing 20–30 teeth. Stipes (5 : 1) with 4, galea 3, labium 2, bristles.

Thorax. Pronotum short, transverse, broadly and deeply emarginate anteriorly, in two narrowly separated tergites which are broadly free and heavily chitinised posteriorly. Spiracle lateral,

projecting, emargination shallow. Mesonotum; scutum, with two minute widely separated bristles in front of the suture, $\frac{1}{4}$ longer than the scutellum, which is bare anteriorly and laterally, with 8–10 minute bristles in the posterior quadrant. Metanotum with three bristles at each side. Mesosternum proper sharply separated from the mesopleurae. The episternal portion of the latter intumescent, defined by an oval in-crassation which coalesces ventrally with that limiting the sternum. Epimeron large with 4–5 minute bristles at its anteroventral angle.

Legs. Fore coxae practically bare except on the thin chitinous ridge (along the inner surface of apposition), which is clothed throughout its length with dense soft bristles. Femur only $\frac{1}{6}$ longer than the coxa. Tibia, to the end of the dorsal apical tooth, $\frac{1}{2}$ the femur. Posteriorly the 1st tarsal joint bears 7 stout bristles, the 2nd and 3rd 3 each, the 4th 2, the 5th bare. All five have 1 fine apical dorsal bristle and a number of thin spinose processes on the plantar aspect. In the hind-leg the tibia is remarkable for its length and shape, being shorter than the femur and spatulate in profile. The dorsal and ventral edges alike convex, no definite apical ventral angle. There is only one stout tooth-like spine at this angle. In the fore tarsus the proportions of the 1st three joints are 65 : 52 : 52 (in *A. fasciatum* Waterst., 65 : 17 : 34); in the mid tarsus the 3rd joint is relatively longer, and in the hind tarsus shorter than in *A. fasciatum*.

Abdomen. All tergites 1–6 are slit shortly at the middle of the posterior margin, the 1st, which is as strongly chitinised as the others, at the sides as well. The ovipositor is a little shorter than the abdomen. Stylet short and broad with 4 long bristles. Spiracle moderate, broadly oval (fig. 2*e*).

Length, about $2\frac{1}{4}$ mm.; ovipositor, about ·8 mm.

Type ♀ in B. M.

One of a series from Uganda, L. Victoria, on Marida Is. (a very small island south of Wema Is. in the chain between Entebbe and Jinja), in fruit of *Ficus lukanda* Welw., 1919 (*Dr. G. D. H. Carpenter*).

Sycophaginae.

Genus Seres Wtrst. (1919).

Seres Waterston, Ent. Mo. Mag. 3rd Ser. No. 60, p. 275. Dec. 1919.

Genotype *S. armipes* Wtrst., *loc. cit.*, p. 276.

Seres levis, sp. n.

This is a smaller, duller and less metallic form than the genotype, with slightly paler legs, the mid tibiae, *e.g.*, being only faintly embrowned dorsally. Both mandibles (fig. 3*e*) are here tridentate. The funicular joints are relatively broader, the second hardly exceeding the others. The general shape of the head is the same in *levis* and *armipes*, but the proportions are strikingly different (see fig. 3). *S. levis*, sp. n., is less specialised than the genotype, as may be seen in its larger and more normal fore tibia and the longer eye, whose base line extends

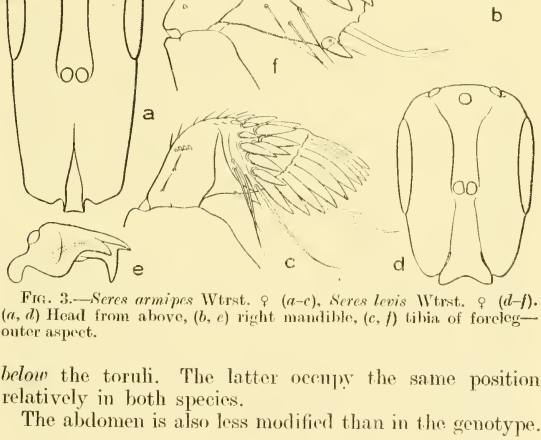


Fig. 3.—*Seres armipes* Wtrst. ♀ (*a–c*), *Seres levis* Wtrst. ♀ (*d–f*). (*a*, *d*) Head from above, (*b*, *c*) right mandible, (*e*, *f*) tibia of foreleg—outer aspect.

below the toruli. The latter occupy the same position relatively in both species.

The abdomen is also less modified than in the genotype.

Head, length ·75 mm., longer than broad (fig. 3*d*), across the eyes 3 : 2 and at the base line of lobes flanking the clypeus 2 : 1. Eyes fully half as long as the head. Toruli well *above* the base line of the eyes, otherwise in the same relative position as in the genotype. Lateral lobes inconspicuous, their sides converging, clypeal projection short, very broad and deeply and evenly emarginate, with a row of bristles (7–9) above and many others scattered irregularly up to the level of the toruli. Antenna ·75 mm. Scape

(6 : 1). Pedicel (2 : 1). Funicle not conspicuously dilated. First three joints of equal length (9), the 4th a trifle longer (10), club in ratio 11 : 9 : 10. The joints of funicle and club are of practically equal breadth (12), the second funicular, a little broader (13). Maxillary palpus 14 : 7 : 7, width of 1st joint at apex 6, terminal bristle twice the supporting joint. Labial palpus 10 : 9. Apical bristle equal to that of the maxillary palpus.

Thorax and Propodeon 1 mm. in length. Pronotum quadrate with anteriorly convergent sides, over half as long as the combined scutum and scutellum. Parapsidal and axillary sutures interstitial. Scutellum with 4 bristles one at each side posteriorly on the axillary suture and another at the hind edge. Metapleurae striate reticulate with about a dozen minute bristles between the edge and the spiracle.

Wings. Fore-wings, length 1·4 mm., breadth ·6 mm., 5 bristles on submarginal. On marginal + postmarginal there are at the edge and on the surface about a dozen bristles besides the solitary one at the base of the radius. Discal ciliation a little denser and darker than in the genotype. Hind-wings (19 : 5). Length 1·1 mm.

Fore-legs. Femur (fig. 3*f*) more elongate (7 : 2) than in *S. armipes*, ventral edge straight, dorsally convex. Tibia with only 3 peg-like spines, 1 at apex ventrally and 2 dorsally. Tarsus, first three joints as in *armipes*. Mid- and Hind-legs. In the mid tarsus the first and second joints are in ratio 5 : 4 (*armipes* 5 : 3), and in the hind tarsus these two joints are sub-equal (*armipes* 5 : 4). Second hind-tibial spur $\frac{2}{5}$ of the first.

Abdomen + ovipositor over 1·4 mm. The ovipositor about ·25 mm. Tergites 1 and 4 are longest and sub-equal and about $\frac{1}{4}$ longer than 2, which is shortest; 3, 5 and 6 are equal, slightly exceeding 2. Tergites 1–4 show three, and tergite 5 one, slits posteriorly. The deepest slit on tergite 1 extending to $\frac{1}{4}$. Spiracle minute, circular, its diameter $\frac{2}{5}$ the length of the stylet (much larger in *S. armipes*, the diameter $1\frac{3}{4}$ as long as the stylet). Tergite 6 with median row of 4 bristles (2, 2) and a patch of bristles (10–12) on the inner side of each spiracle, 1–2 of the bristles being longer than the others.

Length, about 3 mm.; alar expanse, 4·6 mm.

Type ♀ in B. M.

One of a series from Uganda, L. Victoria, on Marida Is. (a very small island south of Wema Is. in the chain between Entebbe and Jinja), in fruit of *Ficus lukanda* Welw., 1919. (*Dr. G. D. H. Carpenter.*)

V. *The Terminal Abdominal Structures of the Primitive Australian Termite*, Mastotermes darwinensis *Froggatt*. By G. C. Crampton, Ph.D., F.E.S. (Massachusetts Agricultural College, Amherst, Mass.).

[Read February 4th, 1920.]

Plate IV.

Through the kindness of Dr. R. J. Tillyard I have been able to examine a few specimens of the extremely interesting Australian termite, *Mastotermes darwinensis* Froggatt, preserved in spirit. Since these insects are in some respects among the most primitive representatives of the order Isoptera, and since they are available for study to but few fortunate individuals, it may possibly be of some interest to describe briefly their terminal abdominal structures, which have not been figured before, so far as I am aware. The terminology here applied to the parts is that proposed for insects in general in a paper dealing with the terminal structures of male insects, published in the June 1918 issue of vol. xiii of the Bulletin of the Brooklyn Entomological Society (pp. 49–68), and in an article dealing with the terminal structures of female insects, published in the December 1917 issue of vol. xxv of the Journal of the New York Entomological Society (pp. 225–237).

There were two types of winged specimens in the material which I examined; but since I was permitted to retain only one winged specimen (which I wished to keep intact for a further study of the external morphology of these insects, and for a comparison with other termites) I have been unable definitely to determine, by dissecting them, which of the winged forms are males, and which are females. In the alate forms of many termites, however, the males bear styli and the females do not, and from what is known of related forms, I think that we are justified in assuming that in the winged caste of *Mastotermes* also, those forms which bear styli are males, and those which do not are females; but until this point has been definitely determined by dissection, the interpretation here given must be regarded as purely provisional. I might state, however, in this

connection, that I have dissected specimens of *Termopsis angusticollis* Hagen, which are placed in the family Protermitidae (to which *Mastotermes* also belongs) by Holmgren, and an examination of these forms has served to substantiate the conclusions here drawn concerning the sexes of the alate caste of *Mastotermes*.

In both types of winged forms of *Mastotermes* (Pl. IV, figs. 1 and 2), there are ten visible tergal plates in the abdomen. The sternal plates, however, are not situated immediately below their corresponding tergal plates in the posterior region of the abdomen, and the number of sternal plates is not the same in the two sexes, there being but six apparent, well-developed, pigmented, sternal plates in the winged forms which I have interpreted as the females, while there are eight of these sternal plates in the winged "males." In both forms the sternal plate of the real first abdominal segment has become atrophied (or at any rate, it cannot be readily detected), so that what appears to be the first abdominal sternite, is in reality the sternite of the actual second abdominal segment, while what appears to be the second sternite, is in reality the sternite of the actual third abdominal segment, and so on.

As was mentioned above, there are apparently but six distinct ventral plates in the abdomen of the winged "female" of *Mastotermes*, and since what appears to be the first sternite is in reality the sternite of the actual second abdominal segment, etc., the apparent sixth ventral plate ("hg" of Pl. IV, figs. 1 and 3), which is unusually large, represents the sternite of the actual seventh abdominal segment. This is in agreement with the statement made by Holmgren, 1909, on page 150 of his "Termitenstudien," that the seventh sternite is much larger than the others in the abdomen of female termites in general.

I at first thought that the stippled terminal area of the seventh abdominal sternite shown in Pl. IV, figs. 1 and 3, might represent the remains of another abdominal sternite entering into the composition of the unusually large sternite "hg," since in the alate females of our Californian Prototermitid *Termopsis* (which are more primitive than those of *Mastotermes* in having retained a distinct sternite behind the seventh abdominal sternite) a distinct, though small, eighth sternite occurs in approximately the same position as that occupied by the terminal stippled area of the sternite labelled "hg" in Pl. IV, figs. 1 and 3. The condition

exhibited by the seventh abdominal sternite of the female soldiers and workers of *Mastotermes* (text-figure 1), however, would indicate that the stippled terminal area of the sternite labelled "hg" in Pl. IV, figs. 1 and 3 does not represent the remains of a formerly distinct sternite. The area in question was of greater extent in the alate female shown in fig. 1 than in the one depicted in fig. 3, and I

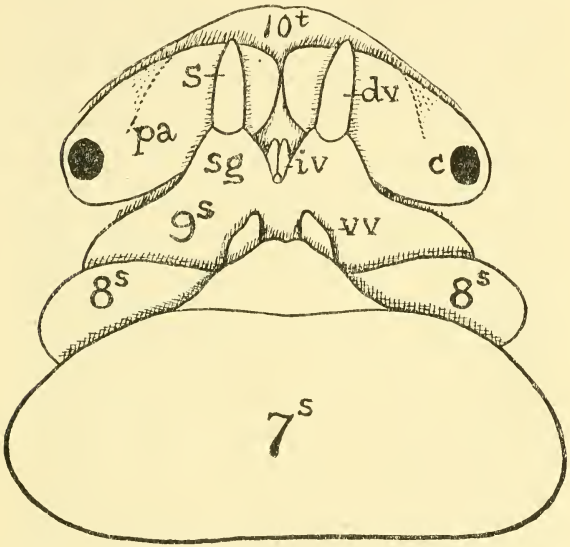


Fig. 1.—Terminal ventral abdominal plates of a female of the soldier caste of *Mastotermes*. For interpretation of lettering, see list of abbreviations at end of article.

am inclined to think that the latter is the more typical in this respect, although I have not been able to examine any other specimens of *Mastotermes* in order to determine this point.

Holmgren, 1911, on page 32 of the second part of his "Termitenstudien," quotes the following from a paper by Silvestri (which I have been unable to obtain) in describing the abdomen of the female of the worker caste of *Masto-*

termes : "Abdominis sternum septimum in parte postica mediana angustatum, productum, margine postico sinuato, sternum octavum et nonum nondum obtegens. Sternum octavum appendicibus genitalibus duabus brevibus; sternum nonum stilis instructum." Since the abdomen of females of the soldier caste is similar to that of the worker caste, the above-cited description applies equally well to the female soldier depicted in text-figure 1 of the present paper, since in the figure in question the seventh abdominal sternite is narrowed posteriorly in the median region, it is somewhat produced, its posterior margin is sinuate, and it projects slightly over the eighth and ninth sternites. The eighth sternite likewise bears two "genital appendages" (labelled "vv" in text-figure 1), and the ninth sternite bears a pair of styli "s." I find in addition, however, a third pair of appendages labelled "iv," which are very small, and on this account apparently escaped Silvestri's attention, although they occur in the females of both soldiers and workers. The intermediate appendages, labelled "iv" in text-figure 1, occur between the bases of the styli, labelled "sg." There is some indication that they may possibly belong to the sternite behind the ninth (*i. e.* the partially atrophied tenth sternite) which would be in agreement with the claim made by Dr. Wheeler, that the intermediate valves of the ovipositor belong to the tenth segment of the embryo (and come to have their position between the dorsal valvulae of the adult as a later modification), but my material was too poorly preserved definitely to determine this point.

Dr. Walker (Canadian Entomologist, vol. li, 1919, pp. 131–139), following Wood-Mason, Handlirsch, Berlese, and others, would interpret the dorsal valves of the ovipositor of Orthopteroid insects as representing the styli together with their basal portions "sg" (text-figure 1), from his studies on *Grylloblatta*; and the condition exhibited by the females of the worker and soldier castes of *Mastotermes* would uphold this view, for it is quite evident that the ventral appendages labelled "vv" in text-figure 1, represent the ventral valves of a primitive ovipositor, while the appendages labelled "iv" represent the intermediate valves, and the styli "s," with their basal portions "sg," apparently enter into the composition of the dorsal valves of the ovipositor of the Orthopteroid forms (see also figures of "*Blatta*," by Wood-Mason). The presence

of this primitive type of ovipositor in *Mastotermes* furnishes further evidence of the rather close relationship between *Grylloblatta* and the termites.

In the winged "males" of *Mastotermes* there are eight apparent abdominal sternites, as was mentioned above; but since the apparent first sternite is in reality the sternite of the actual second abdominal segment (the sternal plate of the first segment being atrophied, or so greatly reduced as to be no longer readily detected), the apparent eighth sternite, labelled "ha" in Pl. IV, figs. 2 and 4, represents the sternum of the actual ninth abdominal segment. In the males of *Grylloblatta campodeiformis* Walker, recently figured by Dr. Walker (*l. c.*), the hypandrium, or sternite of the ninth abdominal segment (situated below the genital apparatus of the male) bears a pair of distinct structures, the coxites, or styligers, to which the styli are attached. In the winged male of *Mastotermes* (fig. 4) the styligers "sg" (which may or may not represent the coxal segment of a limb, since the styli themselves are sometimes secondarily segmented) have become greatly reduced, and are partially united with the hypandrium "ha," but traces of them are still retained. A similar condition occurs in the cockroach *Cryptocercus*, shown in fig. 92 of the paper on the genitalia of male insects (Bulletin of the Brooklyn Ent. Soc., vol. xiii, 1918); but I did not realise the true significance of the styli-bearing structures in this insect (*i. e.* the homologues of the styligers "sg" of figs. 2, 4, etc.) until Dr. Walker had published his figures of the condition occurring in the primitive insect *Grylloblatta*.

In connection with the discussion of the styli, "s," and the styligers, "sg." I would call attention to the fact that if one compares Dr. Walker's figure 2 (Can. Ent. vol. li, plate viii) of the ventral region of the terminal abdominal segments of a male *Grylloblatta* with my figure 34 (Bull. Brooklyn Ent. Soc., vol. xiii, plate 4) of the same region of a male *Embia*, the resemblance between the two is very striking. The outline and relative size of the ninth sternite are very similar in both insects, and the so-called two-jointed cerci of *Embia* are remarkably similar to the two-jointed styli (*i. e.* the styli with their basal structures the coxites or styligers) of *Grylloblatta*, not only in position, but in the number and character of their component parts. Dr. Walker, however, maintains that these two structures are not homologous in the insects in question,

and provisionally, at least, I have accepted his verdict in the matter.

The cerci, labelled "c" in all figures, are fairly well developed in *Mastotermes;* but the segments of the cerci are not as distinct as in *Termopsis* (which is another feature in which *Termopsis* is more primitive than *Mastotermes*). There are traces of at least five segments in the cerci of *Mastotermes*, and in all probability several more have fused to form certain of the larger segments.

The paraprocts, "pa," or lateral plates of the eleventh segment, which bear the cerci, are quite well developed in *Mastotermes*, as is also the case with the tenth tergite "10^t." The posterior margin of the tenth tergite of the winged male (fig. 2, "10^t") is "indented" (or slightly emarginate) mesally, while the posterior margin of the tenth tergite of the winged female (fig. 1, "10^t") is entire, and is somewhat "thinner," being more decurved posteriorly than is the case in the winged male.

In previous papers, I have applied the term "epiproct" to the tenth or to the eleventh abdominal tergites indiscriminately, and I have also employed this term as practically synonymous with the designation "pygidium." In the interest of exact usage, however, I would now suggest that the term "epiproct" be restricted to the eleventh abdominal tergite (which is distinguishable in but few insects), while some form of the designation "pygidium" should be employed for the apparent terminal tergite in other cases.

The term "pygidium" is frequently applied to the apparent terminal tergite in higher insects, regardless of whether one is dealing with the actual sixth, seventh, eighth, ninth, or tenth tergite, the actual terminal tergites in such cases being usually withdrawn or "telescoped" beneath the apparent terminal tergite which conceals them, so that what appears to be the terminal tergite or "pygidium," is not actually the terminal one under these conditions. It would be much more exact when this is the case, to prefix to the term pygidium, the Greek designations hexa-, hepta-, octo-, ennea-, or deca-, to indicate that the apparent last tergite is actually formed by the tergite of the sixth, seventh, eighth, ninth, or tenth segment, as the case may be. Thus, the so-called "pygidium" of certain Coleoptera is in reality formed by the tergite of the sixth abdominal segment (the terminal ones being usually with-

drawn beneath it), while the so-called "pygidium" of a cockroach or termite is usually formed by the tergite of the tenth abdominal segment; and in the interest of exact usage, it would be preferable to distinguish between these two types of "pygidia" by designating that of the beetle a "hexapygidium" and that of the cockroach or termite a "decapygidium."

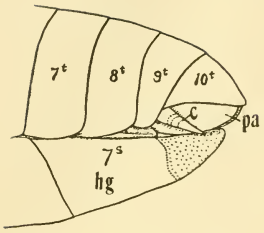
The condition occurring in the terminal abdominal structures of the winged "male" of *Mastotermes* lends additional weight to the view that the termites are rather closely related to the cockroaches, since in both groups the pygidium, "10," is a "decapygidium" (*i. e.* it is formed by the tenth tergite), the paraprocts "pa" are usually well developed in both types of insects, and in the male of the primitive cockroach *Cryptocercus*, referred to above, there are traces of the styli-bearing structures "sg" which are only partially united with the ninth sternite "ha" as in *Mastotermes* (fig. 4). On the other hand, the genitalia of *Mastotermes* and other termites do not exhibit the well-developed, asymmetrical penis valves characteristic of most cockroaches, Mantids, and Zoraptera; and since the termites belong to the superorder Panisoptera (composed of the Isoptera, Zoraptera, Mantodea, Blattodea, etc.), it is rather surprising that such primitive forms as *Mastotermes* should not exhibit some indications of such a widespread condition occurring in the bulk of their relatives in this group. It is possible, however, that since some termites such as those here discussed have been found to have developed a primitive type of ovipositor (a condition occurring extremely rarely among Isoptera), still others will be found in which traces of the penis valves are retained. Indeed, in the winged males of *Termopsis*, there are traces of the penis valves, but they are so small and delicate that one can scarcely see them, and they are quite unsatisfactory for a comparative study of the structures in question.

In Vol. 21, 1919, of the Proceedings of the Entomological Society of Washington (pp. 129–151), in an article dealing with the terminal abdominal structures of the most primitive representatives of the Hymenoptera (*i. e.* the sawflies), it was shown that the hypandrium, or plate below the male genitalia ("ha" of Pl. IV, figs. 2 and 4), is in most insects formed by the sternite of the ninth abdominal segment, or those preceding it, rather than by the tenth sternite, as was formerly claimed. Furthermore, as is the case in

Mastotermes, the sternite of the seventh, or preceding segments, as well as the eighth sternite, may form the plate below the genital apparatus of female insects in general.

In comparing together the terminal structures of insects in general, I have been impressed with the marked resemblance between the terminal structures of the sawflies and those of the termites (with the exception of the genital apparatus of the males, since the styli of male termites apparently become modified to form clasping organs in the male sawflies), and there are a number of features which point to a rather close relationship between the two groups. These resemblances have led me to conclude that the Psocidae (*s. l.*), Hymenoptera, Mecoptera, Neuroptera, and Coleoptera probably arose from ancestors anatomically intermediate between the Isoptera (with the Zoraptera) on the one hand, and the Dermapteron-Embiid-Plecopteron group on the other. Furthermore, the Isoptera are themselves intermediate between the Blattodea (with the Mantodea) and the Dermapteron-Embiid-Plecopteron group, and because of this phylogenetically important position which they occupy with relation to the lines of descent of the other orders of insects, their anatomy should be more carefully studied than has been the case heretofore.

I have suggested in previous papers, that the Palaeodictyoptera, Ephemerida and Odonata might possibly be associated together in a section of the Pterygotan insects, and while this arrangement holds good for certain of the Palaeodictyoptera, it is not true of all the insects included in this order, which appears to be a very heterogeneous conglomeration of insects, of which certain forms are not sufficiently nearly related to be included in the same order, or even superorder. Thus for example, I would now consider such Palaeodictyoptera as the Stenodictyoids (or those related to *Stenodictya*) as belonging in the superorder Panplecoptera, which includes the Plecoptera, Embiodea, Dermaptera, Coleoptera and their allies (to which might be added such fossil forms as the Hadentomodea, Haplopterodea, etc., although I am not certain as to such forms as the Sypharopterodea). On the other hand, some of the insects now placed in the order Palaeodictyoptera, such as the Eubleptidae, bear a strong resemblance to the insects comprising the superorder Panplectoptera, composed of the Ephemerida (also called Plectoptera), Protephemerida (*Triplosoba*) and their allies. Handlirsch would derive



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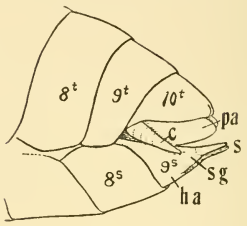

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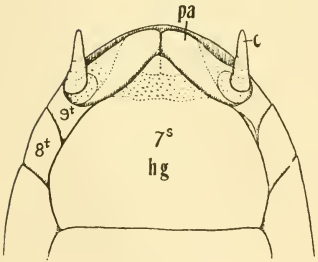

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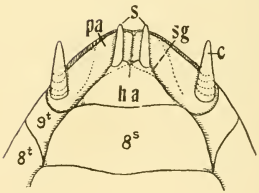


4

TERMINAL ABDOMINAL STRUCTURES OF *MASTOTERMES DARWINENSIS* Frogg.

the Protoblattodea (which he considers as the forms ancestral to the cockroaches, termites, etc.) from Placodictyopterous forebears, while I am inclined to consider the Plecoptera as more closely related to the forms giving rise to the termites and their allies which constitute the superorder Panisoptera (*i. e.* the Protoblattodea, Blattodea, Mantodea, Isoptera, Zoraptera, etc.). The evidence for the grouping given above, will be presented in a series of articles (of which the present paper is one) dealing with the external anatomy of the head, thoracic and terminal abdominal regions of the insects in question.

Explanation of Plate IV.

Fig. 1.—Lateral view of terminal abdominal structures of alate female of *Mastotermes darwiniensis* Froggatt.

Fig. 2.—Lateral view of terminal structures of alate male of same.

Fig. 3.—Ventral view of terminal structure of alate female of same.

Fig. 4.—Ventral view of terminal structures of alate male of same.

ABBREVIATIONS

In all figures, the letter "t" affixed to the numerals denotes the tergal plate of the segment indicated by the numerals, while the letter "s" denotes the corresponding sternal plate of the segment in question.

c = cerci, or their point of attachment.

dv = dorsal valvulae of ovipositor, composed of the styli and their basal portions.

ha = hypandrium, or sternite below the genital apparatus of the male. It is usually formed by the sternite of the ninth abdominal segment.

hg = hypogynium, or sternite below the genital apparatus of the female. It is usually formed by the sternite of the seventh or eighth abdominal segment.

iv = intermediate valvulae of the ovipositor.

pa = paraprocts, or cerci-bearing plates of the eleventh segment of the abdomen.

s = styli.

sg = styligers, or coxites, the basal structures bearing the styli.

vv = ventral valvulae of the ovipositor, or appendages of the sternite of the eighth abdominal segment.

VI. *Records of Insect Migrations in Tropical America.* By C. B. Williams, M.A., F.E.S., Department of Agriculture, Trinidad, B.W.I.

[Read March 17th, 1920.]

In two previous papers (Trans. Ent. Soc. 1917, pp. 154–164, and 1919, pp. 76–88) I have given as complete accounts as possible of migrations of butterflies in British Guiana and Trinidad respectively, that I had either seen myself or considered sufficiently reliable to be placed on record. No apology is made for this further instalment of records, this time relating to several different insects in several countries, as it is only by the piling up of a sufficient bulk of reliable evidence that any progress can be looked for; and such evidence to be of the greatest value should be available to all and should not be hidden away in private notes or obscure publications.

The following are the migrations described or discussed below :—

LEPIDOPTERA.

Pieridae.

Catopsilia (Callidryas) spp. Dutch Guiana.
British Guiana.
Trinidad, 1918.
1919. February.
1919. March.
1919. July.
Jamaica, 1910.
Colombia, 1900, 1914.
Panama, 1917.
Costa Rica.
Mississippi, 1917.

White Pierid. Trinidad.

Lycaenidae.

Tmolus beon. Trinidad, 1919.

Hesperidae.

Calpodes ethlius. Panama, 1917.
U.S.A. and West Indies.

URANIADAE.

Cydamon leilus. Trinidad, 1868, 1878, 1891, 1899, 1901, 1912, 1917, 1918, 1919.
British Guiana, 1912.
Barbados, 1901, 1905, 1906, 1912, 1915.
Venezuela, 1917.
Costa Rica, 1917.

DIPTERA.

TABANIDAE.

Venezuela to Trinidad.

Yellow Butterflies off the Coast of Dutch Guiana.

Mr. Ince of Port of Spain, Trinidad, informs me that about three years ago (1915 or 1916), about the month of July, he saw thousands of yellow butterflies flying in a northerly direction past his steamer, which was about twenty miles off the coast of Dutch Guiana (Surinam), between the river Surinam and the river Nikeri, and well out of sight of land. There is no land in the direction in which the butterflies were flying.

Yellow Butterflies in British Guiana.

Dr. Barnes, who was for many years a resident of Berbice, British Guiana, tells me that migrations of yellow butterflies were a regular event there. The butterflies always flew along the coast from south-east to north-west, which is across the prevailing wind.

This is an additional locality to those given in my previous paper (*loc. cit.*, 1917), but fits in with my general conclusions as to the two main directions of flight.

Yellow Butterflies in Trinidad.

1918.

Since the publication of my account of the migration of *Catopsilia statira* in Trinidad in October 1918 (*loc. cit.*, 1919, p. 76) two further records have been obtained, which may be placed here for reference.

They were seen abundantly on several days during the migration flying towards the west in Tucker Valley near Macqueripe (Brash). [Macqueripe is on the north coast, north-west of Port of Spain.] They were also seen passing

over Rio Claro [in the south-central district] for several days, flying from the south-west to north-east.

1919. *February.*

On the 7th February, 1919, Sir Norman Lamont reported to me that he had seen the yellow butterflies again on migration on the Rock-Penal road (a few miles inland from the centre of the south coast). He wrote as follows :

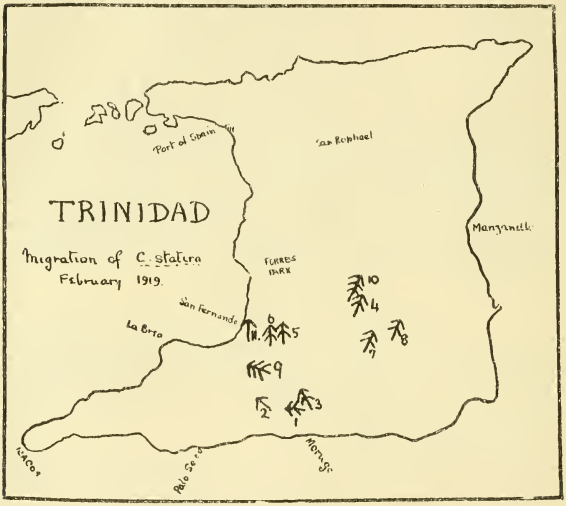


Fig. 1.

"At 12 o'clock at the junction of the Moreau and Rock-Penal road . . . I noticed a steady stream of yellow butterflies flying east to west with the wind. They were of course high over the tops of the trees, crossing the Moreau road, and were in ones, twos, fives, sixes and eights, but in quite loose order. I remained until two o'clock, and the flight was steady all that time. At two o'clock I started east along the Rock-Penal road, and the butterflies were flying along this road which was parallel to their course, and consequently they were able to fly lower. I

caught two specimens, both females of *C. statira* in absolutely perfect condition, evidently just emerged from pupae."

"At about 2.30 or 2.45 the flight stopped. I was then about the 14th mile post, and in cocoa (the Moreau road is in virgin forest). Weather still sunny as it was throughout. I afterwards went home along the Moruga road without seeing a single *C. statira* on or crossing the road (Fig. 1, No. 1)."

On the following day (8th February) I went to the localities in question, and found the butterflies still migrating. At 1.40 p.m. a slight but distinct flight was seen going west or north-west at about the fourth mile from Penal on the Rock-Penal road (No. 2). At 2.15 there was a distinct migration towards the north-west at about the 11th mile (No. 3). The numbers passing in successive minutes at this point, on a front of approximately 100 yards, were 16, 14, 2, 1, 25, 14, and 18. At $12\frac{1}{4}$ mile (Moreau road) they were also moving in the same direction. A few were seen a mile or so beyond this, but after that they disappeared as had been noted the previous day by Sir Norman Lamont.

On the same day they were seen passing Tabaquite in a direction "35 degrees east of north" by Mr. H. Thompson" (No. 4).

During the week commencing Monday 10th, they were reported to be very common flying towards the north at Reform by Mr. Ross (No. 5) and at Tarouba by Mr. Bolton (No. 6), being particularly common on the 12th according to the latter.

On the 13th they were reported flying towards the north-east at Poole by L. Mota (No. 7), and in the same direction at Rio Claro by P. R. B. (No. 8).

On the 14th they were flying west by north on the Debe-Penal road about $3\frac{1}{4}$ mile at 11 a.m., at a rate of 350 per minute on a front of 100 yards (C. M. Roach) (No. 9). "A dense drove" passed over Tabaquite between one and two o'clock in a north-east direction (G. H. Wilcocks) (No. 10), and a large number passed over San Fernando flying approximately from south to north (E. A. Turpin) (No. 11).

On the following day I noticed myself a very slight migration in a northerly direction over San Fernando, but this seems to have marked the last effort, as no further records were received.

This migration is of particular interest, for two reasons. In the first place, it is the first authentic record I have obtained of a migration during the dry season. There is one record in my previous paper (1919, p. 88) in which the butterflies were said to be "looking for water," but the date of this was uncertain.

In the present case the migration was preceded by six weeks of extremely dry weather, as in 1919 the dry season in Trinidad started at the very beginning of January.

The second point of great interest is that the direction of the flight was not the same throughout its range, but consisted of a fan-shaped spread from some area near the middle of the south coast, as will be seen distinctly from the directions of the arrows on the accompanying map (Fig. 1).

1919. *March.*

On 15th March, after two and a half months of extremely dry weather, heavy showers fell over the greater part of the island and continued during the following two days.

On the 17th March, at about 12.30 p.m., yellow butterflies were passing along the east side of San Fernando hill in a northerly direction in sufficiently striking numbers to warrant my being informed by telephone of the event.

On the west side of the hill, where my house is situated, they were then seen to be passing in a very thin but steady flight of three or four per minute, but the movement did not last much longer, and was over by 1 p.m.

1919. *Dry Season.*

Mr. Cecil Rostant, a resident of Moruga (south coast), tells me that "some time about the middle of the dry season" the butterflies passed over Moruga in large numbers. They flew to the west during the morning, but in the afternoon turned northward.

It is impossible to say if this record refers to the February migration or not.

1919. *July.*

Mr. J. A. Bulbrook, a geologist who had been in camp at Palo Seco (south coast) for some months, informed me on 29th July, 1919, that since 11th July the butterflies had been passing irregularly from north-west to south-east. He considers the movement not distinct but quite certain.

Yellow Butterflies in Jamaica.

Mr. W. Buthn of the Board of Agriculture, Trinidad, informs me that about the middle of December 1910 he saw a large flight of yellow butterflies at Rockfort, Jamaica (about three miles east of Kingston), flying in a direction approximately north-west. He described the migration as a thin cloud, and estimated, from memory, that about 100 per minute would be passing on a 100-yards front.

Yellow Butterflies in Colombia.

Mr. Rudder, consulting engineer of the Usine St. Madeline, Trinidad, informs me that in April 1900 he saw a large flight of yellow butterflies in the district Darien, Colombia, at an altitude of three or four thousand feet. The butterflies were flying away from the Pacific towards the east, and "one could get fifty in a net at one sweep." The flight only lasted five or ten minutes, during which time the butterflies came down a certain valley, filling the road through the forest. He could not say whether or not they were also over the forest. The flight was a more or less annual event for which they used to look out each year.

I have been unable to find the locality on a map, but Mr. Rudder indicated it as somewhere towards the Panama border and the Pacific.

Canon A. Hombersley of Trinidad gave me the following notes: "Travelling by river steamer down the Magdalene from Giradot to Ambalema [about 100 miles west of Bogota], towards the end of December 1914, for about six hours I noticed, on the mud flats just above the water edge, swarms of white and white-and-yellow butterflies—densely crowded together and quite still, so as to look like white patches about a yard or more in diameter.

"Leaving the boat, I travelled by train the same afternoon to Mariquita; for many miles there is a mud road running alongside the railway—this road was swarming with the same butterflies, which settled in large densely crowded patches wherever there was mud.

"Travelling back over the same railway two or three days after, on 31st December, I visited a cattle ranch and walked some distance through the pasture along the mud road. This was one continuous swarm of the same butterflies and one other variety (orange-red with black lines)

in dense masses wherever the ground was moist. It is strictly accurate to say, that the swarm of butterflies on the wing was so dense for miles that you brushed against them with your clothes as you walked by."

Yellow Butterflies in Panama.

At Bocas del Toro, Panama, I made the two following notes in my diary :—

"6th May, 1917. Yellow butterflies flying steadily across the river at Guabito [on the border between Panama and Costa Rica] from north to south, 8.30 a.m. Fifteen seen in five minutes, and only one flying in opposite direction."

"4th June, 1917. Guabito. Yellow butterflies going due north at 10 a.m. No wind and very hot sun. I saw one hundred or more pass, and none in reverse direction."

Yellow Butterflies in Costa Rica.

Mr. Jemenes, whom I met at Suretka, Costa Rica, informed me that migrations of yellow butterflies are of common occurrence at San José, Costa Rica, and that the butterflies always fly from north to south. This was confirmed by another man in the same house, who had also resided many years at San José.

Yellow Butterflies in Mississippi.

Mr. L. S. Mestier, chemist at the Usine St. Madeline, Trinidad, informs me that about the middle of November 1917 at Ocean Spring, Mississippi, U.S.A., after a cold spell, he saw a large flight of yellow butterflies flying from west to east across a northerly breeze. The flight lasted for about an hour. The butterflies were "by thousands" "like leaves," and were mostly at a height of from six to ten feet.

Mr. Mestier had lived for four years at Ocean Spring (which is on the coast about fifty miles west of Mobile), but this was the first time that he saw any flight of this nature.

White Butterflies in Trinidad.

Mr. Fahey of Industry Estate, Trinidad, says that some years ago he saw a large flight of "small white butterflies" at Manzanilla on the east coast of Trinidad, flying from east to west and coming inland from over the sea.

There is no land to the east of Trinidad, and the only possible explanation of this flight seems to be that the butterflies had migrated out to sea northward from the Guiana or Venezuelan coast, and had been blown westward to Trinidad by the prevailing westerly trade wind.

In a previous paper (*loc. cit.*, 1917, p. 162) I mentioned a record of a flock of the small white Pierid, *Appias margarita*, flying northward out to sea at Berbice, British Guiana, in 1909.

It is extremely unlikely that the two records refer to the same flight, but the latter record at least lends considerable probability to the proposed explanation of the former.

Lycaenidae.

Tmolus beon in Trinidad.

On the 23rd March, 1919, I visited the famous Pitch Lake at La Brea, Trinidad [south-western promontory]. At 4.15 p.m. we noticed a large number of small blue butterflies passing in a continuous stream across the open stretches of the "lake," which is largely devoid of vegetation.

The migration was watched for at least a quarter of an hour, and it was in full swing both at the beginning and end of this period, so that it may have lasted much longer.

The butterflies were flying fast and very low, seldom above five feet from the ground, and often less than a foot above it.

They were flying almost due south, slightly S.S.W. The wind was a fairly strong easterly breeze, so that the direction of flight was almost directly across it.

In successive minutes on a 30-yards front the following numbers were counted, 25, 8, 12, 15, 17. The flight was going on as far as one could see in both directions, so that even in the short period that we were watching many thousands must have passed.

I had no net at the time, and only four specimens were caught by knocking down with our hats. Two of these were smashed beyond recognition. The other two were forwarded to Mr. W. J. Kaye, who kindly identified them as *Tmolus beon* Cram., a common Trinidad species. Both were males.

During the period that we watched only three Lycaenids were seen flying in any other direction, and occasionally a yellow butterfly was following the general rush southward.

The weather from January to the middle of March had been excessively dry in this district, but in the second half of March some rain had fallen, which slightly relieved the drying up of the vegetation.

This is the first record, so far as I am aware, of a Lycaenid migrating in this part of the world. There is one account of a migration of a member of this family in India where De Rhe Philippe (Journ. Bombay Nat. Hist. Soc., xiv, p. 481) records that *Polyommatus boeticus* migrates annually to the hills in the early hot weather. I have not seen the paper, which is referred to in Lefroy, "Indian Insect Life," p. 419.

Hesperidae.

Calpodes ethlius migrating in Panama.

From 14th February to 25th June, 1917, I stayed at various localities in the district of Bocas del Toro, Republic of Panama, chiefly at a small settlement known as Guabito, which is on the border-line of Panama and Costa Rica about twenty miles inland from the Atlantic (Carribean) coast.

The country is mostly low-lying forest land with occasional low foot-hills or spurs from the higher land further in the interior, and is partly cleared for banana cultivation.

The rainfall during January and February in 1917 had been a little below the average, but the second week in March was exceptionally wet, and eight inches of rain was registered in twelve hours a few miles from Guabito; for several weeks after this the forest was flooded in many low-lying parts.

On 2nd April I noticed a "moth-like insect" flying in large numbers past the house at about 4 to 4.30 p.m., flying *very rapidly* in a northerly (N.E. to N.W.) direction. It was a hazy afternoon, practically no wind and the sun just visible through thin clouds.

On the following day (3rd April) at 4 p.m. the same insects were again passing "? in all directions." At 5 p.m. they were still flying in a slight rain.

Two specimens were captured, and proved to be a skipper (Hesperid) butterfly, since identified by Prof. E. B. Poulton as *Calpodes ethlius* Cramer.

On the following day (4th April) a careful watch was kept, but none were seen either in the morning or evening.

On the 5th April at 4.15 p.m. they were again flying in

thousands past Guabito Station at a great speed, going towards the east or south-east. About a quarter of an hour later at a spot about half a mile north of the railway station, and just over the border into Costa Rica, they were flying due east in enormous numbers—300 or 400 per minute on every 100-yards front.

Nothing was seen of them again for over a month, but in the interval I questioned Mr. Ladd, a local amateur naturalist, who said that he had frequently seen them, that they only flew in the late afternoon and evening, and that *they changed the direction during the evening*, flying at first in one direction and later all returning in the opposite.

Several other residents agreed as to the frequence of their appearance, and a Mr. Weaver who lived several miles north of Guabito at Paraiso, Costa Rica, said that they always flew in the late afternoon and from north to south.

On 10th May at 4.45 p.m. I again noticed them passing the house three or four per minute in almost every direction, but possibly more from north-east to south-west than any other way. By 6 p.m. when it was getting dusk they were still flying, and were possibly more common in a reverse direction but not distinctly so. It was again slightly cloudy after a hot day and no wind. Temperature at 6 p.m. 78° F.

On 24th May they were again passing in the evening, with a thinly clouded sky after a hot day with no wind.

At 4.50 p.m. they were first noticed in numbers, almost all going to the south or south-west past the house. At 5 p.m. very few were seen. At 5.5 another lot appeared, this time going towards the north and north-west. From 5.40 to 6 they were passing in almost every direction, but chiefly towards the north or towards the south.

By 6 o'clock it was dusk, and the butterflies were difficult to see except as shadows against the light. By lying on my back on the ground I was able to count those passing within my range of vision. In successive minutes 30, 48, 40, 33, 40, 35, and 32 were counted. "About equal numbers going to the north-west and the south-east, but very few in any other direction." At 6.30 it was almost dark, and none were seen.

Three more specimens were captured to-day.

The height of the flight was about three to twenty feet above the ground and the speed was very great, at least twenty miles an hour if not much more. It was sufficiently

great to make it quite impossible for me to tell to what family or even to what order the insect belonged until one was captured, and over one hour's continuous effort to capture specimens, passing sometimes almost every second, only resulted in the capture of five individuals.

Prof. Poulton informs me that all these five specimens were females.

This concludes my own observations on the insect, as it was not seen again during my stay in the district.

To summarise :—The butterfly flew in large numbers, at a great speed, in various directions, but chiefly from north or north-west to south or south-east and vice versa, in the late afternoon and evening * of cloudy, close, still days during April and May with a very slight indication of a change in direction as the evening progressed. In addition all the specimens captured were females.

It may be maintained that a flight of this nature is not a true migration, and it is possible that this is so. At the same time it is a flight which differs distinctly from the normal fluttering of the insect round flowers, and as such would be worthy of record. There are, however, certain known observations with regard to this insect which make it probable that this habit, if not always truly migratory, may sometimes at least lead to a migration.

Calpodes ethlius feeds in its larval stage on the leaves of *Canna*. Its distribution is from S. Carolina to the Argentine Republic, but it appears to be unable to survive the winter much further north than Florida. On occasions, however, the insect appears in large numbers as far north as the district of Colombia, and rarely even as far as Long Island, New York.

F. H. Chittenden (U.S. Dept. Agric. Bur. Ent., Circular 145 (1912), pp. 1–2) gives some particulars of an invasion in September 1904, when thousands of caterpillars were destroying cannas in Alabama, and in the following year, 1905, when they reached as far as Washington D.C. He writes (p. 2) : " The cause of this invasion was apparently that the summer of 1905 was an unusually hot one. Heat favours an increase of insects of this type. Prevailing southerly winds, however, were probably more potent

* Chittenden (U.S. Dept. Agric. Bur. Ent., Circular 145, p. 7) says, " Wittfield adds that one of the favourite times for flight of the butterfly in fair weather is after sundown," but I have been unable to trace the original reference.

factors in causing this migration from the Gulf Region northwards, since the summer of 1906 was still warmer, but with much greater humidity, and under these conditions only one pupa was found during that entire year."

In 1911 there was another invasion, which reached as far as Long Island, of which the following particulars were kindly given to me by Mr. F. E. Watson of the American Museum of Natural History. He tells me that two specimens, one battered and one in fair condition, were captured during May 1911, one on Long Island and one in Prospect Park, New York City. During August all the cannas in the parks in this district were eaten up by thousands of larvae, from which pupae were obtained which gave *indoors*, adults in October and November, but out of doors no adults were seen either that autumn or the following year.

There can be no doubt that these sudden extensions of range were brought about by some form of migratory flight.

In Trinidad and the West Indies the butterfly is generally abundant, sometimes sufficiently so as to rank as a pest of canna and arrowroot, particularly in St. Vincent.

During three years' residence in Trinidad I have never seen any migratory movement of this butterfly or any flight in any way resembling that seen in Panama. On the other hand, the sudden appearance of the insect in large numbers in some of the smaller islands, indicates very strongly that these migratory movements take place here also. In the West Indian Bulletin, vol. 3, 1902, p. 234, *Calpodes ethlius* is mentioned in an article on insect epidemics as an example of an insect which is liable to very sudden increase in numbers, only later to decrease equally suddenly. No suggestion is however made that the outbreak might be due to migration.

There was a severe outbreak of the pest in St. Vincent in 1900 and again in September 1901, the latter being the occasion of a short investigation by H. M. Lefroy, then entomologist to the Imperial Department of Agriculture for the West Indies.

In "Indian Insect Life," p. 421, Lefroy says: "From time to time one reads in newspapers of a swarm of butterflies having been seen flying steadily in a particular direction. We have seen this in the case of the West Indian skipper (*Calpodes ethlius*) which was extremely abundant."

No further particulars are given, but in answer to an inquiry Prof. Lefroy kindly sent me the following information: "My reference was badly worded in 'Indian Insect Life.' I saw the case myself in St. Vincent when I was proceeding in the 'passage boat' along the coast from the port [Kingston] to the neighbourhood of Soufrière. I was then after the arrowroot skipper, and noted this migration, many butterflies flying steadily from the land over the sea in one direction. I have forgotten the geography, but I imagine they were flying east."

With the help of Mr. H. A. Ballou I have seen Lefroy's original report on this visit to St. Vincent, in which he says: "I observed many flying over the sea at a distance of half a mile from the shore, proceeding along the coast. Large numbers were flying about the fields and roads, and they could be seen laying eggs in the fields of arrowroot" ("St. Vincent Gazette," 27th September, 1901).

Another outbreak of this insect is referred to in the "Report of the Department of Agriculture in St. Vincent for the year ending 31st March, 1907," p. 13, where it is stated: "The cultivation suffered a good deal during the early part of the year [? 1906] from attacks of the arrowroot worm." One estate is mentioned as having its yield reduced from 700 to 500 barrels of starch.

In the report of the same Department for 1912–13, p. 15, it says: "In most fields seen the degree of infestation was not severe, nor were the adults observed in great numbers except on one field on the windward side, where in passing in the early morning enormous numbers of adults were seen flying."

This note is of considerable importance in connection with the previously mentioned records of its flight at dusk, and these unusual hours of flight might account for the lack of more frequent records of its movements.

In 1913–14 the insect "was in evidence, but did little damage." In 1914–15 "Arrowroot was again attacked somewhat severely in the Leeward district" (Report 1914–15, p. 8), and in 1915 the insect caused extensive defoliation in some districts. "After a time large numbers of parasites appeared, and there was a gradual reduction in the pest until none were seen. The first outbreak occurred in May 1915, and the parasites reared comprised three species of Tachinid flies. No egg parasites were discovered during this outbreak. A second outbreak followed in

August, and on this occasion control was finally effected by an unidentified egg parasite, the Tachinids being rare" (St. Vincent Rept. of the Agricultural Department for 1915–16, p. 17).

In 1919 S. C. Harland, who has studied the life-history of the insect in St. Vincent, wrote to me as follows: "*Calpodes* was very abundant in St. Vincent for several months in 1916, but never abundant at the Experimental Station since. Apparently the eggs are parasitised as soon as laid. I can find the eggs all the year round, but they don't seem to hatch except at certain periods. This year, 1919, I noticed attacks on the windward coast. I have never seen any migration. I don't think that migration from island to island comes into play at all. We have more of its food-plant here than any other island, and it may be possible that the mature insects fly northward."

Harland is of the opinion that the sudden outbreaks are due to temporary lack of parasites rather than to migration. We have, however, positive evidence of the migration of this butterfly and, in spite of Mr. Harland's remarks, I think that it will be found to be the explanation of many of the outbreaks of the insect in the West Indies. The rapid reduction of the outbreaks may be explained by the abundance of the parasites, but to explain the original increase of the insect by a decrease in the parasites puts us only one stage back in the inquiry. Doubtless the unusual hours of flight and the high speed attained has caused many migrations to be overlooked, or, when seen, to be confused with some other insect.

Cydamon leilus.

Cydamon leilus in Trinidad.

The day-flying moth *Cydamon* (*Urania*) *leilus* is well known for its migratory habits. Isolated records of its migrations are scattered through entomological literature. I have given below all the information that I have been able to obtain with regard to its occurrence in Trinidad. Some of the records have been published before, but mostly in obscure local periodicals. The particulars for the years 1917, 1918, and 1919 are from my own observations.

1868. H. Caracciolo in the Journal of the Trinidad Field Naturalists' Club, vol. i. (1892–1894), p. 16, says that

C. leilus was very common about the year 1868, but was rare for the next ten years.

1878. According to the same authority (*loc. cit.*) the moth was again abundant in 1878. He describes how in October of that year "on Forres Park Estate, Claxton Bay, hundreds of these *Urania* filed soldier-like over the roof of my hut in one continuous string from 4 to 6 p.m., flying in a Southerly direction. Where could they be going to? They were evidently on a long journey, for I watched them as far as the eye could reach, and saw them passing over several of our small hills without interrupting their course. It is quite possible that they were emigrating, for their course being southerly they would reach Icacos [south-western promontory], and from there return to Venezuela across the Serpent's Mouth. Since then I have not seen them in such large quantities; they appear every year, but in smaller numbers."

1891. Caracciolo (*loc. cit.*) writes: "One day last September [1891] I observed them very closely. They were passing over the roof of the customs house, and flying about three feet over the surface of the sea. Occasionally they would swoop down and tip the surface of the water. Since writing the above Mr. Guppy assures me that he came across one by Caledonia Island floating on the sea." No direction of flight is given in this account.

1899. In a letter, Mr. T. I. Potter informs me "the most important migration of *C. leilus* that I can remember was that of 1899, July to October. The day-moths flew in thousands from N.W. to S.E. at Brighton—apparently crossing the gulf from Venezuela. They were very common on the Queen's Park Savannah [Port-of-Spain] that year, also flying from N.E. to S.W. in the morning and vice versa in the evening." "I cannot now recollect whether they reversed their flight at Brighton in the afternoon, and I don't think I noticed this. I know they flew down there very late in the evening, because I used to catch specimens on my dining-table after dark."

1901. In this year the moth again appeared in large numbers. P. L. Guppy (Trans. Ent. Soc., 1907, pp. 405–410) has given some notes on this migration from which the following extracts are taken:—

"From the early part of September we had them here by thousands, lasting for about five weeks." . . . "Flying both eastward and westward and seen a mile out at sea"

(Mr. E. Johnstone, San Fernando). "Flew in thousands past the pier" (Mr. Potter, La Brea).

Mr. Guppy says the moth is generally common about July and August, abundant in September, and by October only solitary examples are seen. He found eggs and caterpillars in Trinidad, and was thus able to show that the island is not entirely dependent for this insect on migrations from the mainland.

"Since 1901 they have not been common" (Guppy, *loc. cit.*, written in 1906).

1912. On the 4th September of this year Mr. C. M. Carmona of San Raphael wrote to Mr. F. W. Urich as follows: "Since this morning a large amount of butterflies has been passing over here at an altitude of 60 or 70 feet, and increasing in numbers more and more. They are coming from the south and going straight north." Some of the "butterflies" were enclosed, and were identified by Mr. Urich, to whom I am indebted for the record, as *Cydamon leilus*.

In this year the moth appeared in numbers in Barbados and British Guiana (see below).

1917. I was in Trinidad in the fall of 1916, but did not notice any unusual abundance of *C. leilus*. In 1917, however, a very distinct migration took place, of which I give the following records from my own notes.

On 11th September a number of isolated specimens were seen throughout the day at La Fortunée (about six miles south of San Fernando) all flying towards the north-east quarter.

On the following day (12th September) at Malgretout (about six miles east of San Fernando) isolated specimens were again seen flying in the same direction. About 40 specimens were seen during the day.

On the 13th September at Tarouba (two miles east of San Fernando) they were still flying in the same direction in small numbers.

From this date until the 23rd I was unable, owing to illness, to make any observations, but I was given to understand that the moths continued to fly at Tarouba in about the same numbers; and an officer of one of the motor patrol boats informed me that he saw them flying over the sea at Cedros in the same direction.

On the 25th September they were again seen at Tarouba passing in much greater numbers, all going north-east

against a strong easterly wind. Forty were counted in five minutes crossing a front of about 100 yards. The wind was so strong that the butterflies were caught in eddies at the edges of fields of tall sugar-canes, and a large number would be sheltering in such spots only to take the first opportunity to escape and continue their journey in the right direction.

After this the migration continued, according to the manager of Taronba estate, in diminishing numbers for some days, but on the 5th October, when I next visited this locality, only a single specimen was seen, although this belated example was nevertheless hurrying in the same direction as the others.

Mr. Fahey of Palo Seco (south coast) informs me, without being able to give exact dates, that the moth was abundant in his district, flying from south to north from over the sea for days and days.

Although he has resided for some years in the district he has never seen any flight in the reverse direction.

Dr. E. R. de Verteuil, a resident of the same district, says on the contrary that he has seen them flying from Trinidad to Venezuela, but cannot recall the year or month.

1918. There was apparently no migration of *C. leilus* to Trinidad in this year. I saw the moth at intervals during the year at the following places and dates :—May 14th, Arima-Blanchisseuse road, three specimens. June 16th, Siparia, two specimens. July 11th, La Fortunée, one specimen. August 1st, La Fortunée, one specimen flying east (P. Creteau). September 11th, La Fortunée, one specimen flying west (P. Creteau). September 25th, Caroni, one specimen. October 20th, Palo Seco, one specimen. November 18th, Hermitage, one specimen flying north-east.

1919. The same remarks apply to this year also. Individual specimens were seen as follows :—February 8th, Rock-Penal road. July 15th, Harmony Hall. July 27th, Maracas Valley (Northern Range). July 29th, Maracas Valley and Caroni. September 8th, Hermitage, one flying rapidly north-east.

Cydamon leilus in British Guiana.

In Timehri (The Journ. of the Agricultural and Commercial Soc. of British Guiana) 3rd Series, vol. ii. (December 1912), p. 402, H. W. B. Moore records *C. leilus* as being

abundant all along the Coast of British Guiana from Berbice to Essequibo from June to August of 1912. This record is inserted here, as we have seen that in 1912 they were also present in numbers in Trinidad, and also as, being in an obscure journal, it is likely to be overlooked by other observers.

I was in British Guiana from June to September 1916, and only have recorded a single specimen at the mouth of the Waini river on 14th June.

Cydamon leilus in Barbados.

1901. In the Agricultural News of the West Indies (Barbados), vol. i, No. 4 (June 7th, 1902), p. 56, there is an unsigned article on the "Blue Page Moth" from which the following is taken: "During the gale that reached Barbados and St. Vincent on August 26th, 1901, numbers of a large moth were found in Barbados of a kind not previously known to breed there. They had evidently been brought by the high south-west wind. Some were caught and were identified as *Urania sloanei* [see below], the 'blue page' of Trinidad, and they had apparently come from the mainland or more probably from Trinidad itself. They were found as far north as Dominica, and one was caught on R.M.S. 'Eden' half-way between St. Lucia and Barbados. . . . The direct distance from Trinidad to Barbados is about 160 miles, and to Dominica some 100 miles more."

On p. 168 of the same journal is a note to say that the identification was wrong, and that the species was *Urania* (*Cydamon*) *leilus*.

1905. There is a specimen in the collection of the Imperial Department of Agriculture for the West Indies labelled "Barbados, August 1905." See also under 1906.

1906. In the Agricultural News (Barbados), v. No. 117, 20th October, 1906, is the following note: "At the present time a moth is being found in Barbados which was noticed in that island during the gale of 26th August, 1901. This is the Green Page Moth (*Urania leilus*). . . . About a year ago several specimens were caught in Barbados, and it seems probable that it is breeding here." This last deduction is almost certainly incorrect.

1912. In the card index of the Barbados Department of Agriculture is a note to the effect that the insect was

seen in numbers on July 31st, 1912, at Carrington (St. Phillips), after a gale from the south. I am indebted to Mr. Bovell, Director of Agriculture, for this record.

Mr. Nowell, of the Imperial Department of Agriculture, informs me that the insects of this migration were all rapidly eaten up by the local species of Tyrant Fly-catcher (*Tyrannus rostratus* Sclater).

1915. There is a single specimen in the collection of the Imperial Department of Agriculture labelled " Barbados, August 1915."

It has been pointed out that in two of these years (1901 and 1912) in which they occurred in numbers in Barbados they were also recorded as abundant in Trinidad.

Cydamon leilus off the Coast of Venezuela.

On 15th January, 1917, I saw a specimen of this same moth flying over the sea about four miles from the coast and about 100 miles west of Trinidad.

Cydamon leilus in Costa Rica.

On 4th March, 1917, I noticed a distinct migration of this insect at Suretka, Talamanca, Costa Rica (near the Atlantic coast and the Panama border). At 4.15 p.m. they were seen in numbers all going very fast towards the west (up the river). There was at the time a slight north-east breeze and the sky was overcast. Three specimens were captured, of which two were females and one a male. They were passing from 4.15 to 5 p.m. Two were seen at 5.15, and the flight probably continued a little after this.

At 8.45 a.m. on the following day, still cloudy, one was seen flying in the same manner in the same direction, but I left the locality a few minutes afterwards and saw no more.

On the 20th of the same month I saw a single specimen flying full speed in the same direction at Guabito, which is about twenty miles east of Suretka and just over the border-line into Panama.

Mr. Jemenes, who had lived near Suretka for some years, informed me that the migrations of this moth were frequent and usually from north to south, and that in the district of San José, Costa Rica, where he had also lived, he had seen migrations in the same direction.

Migration of Tabanidae (Diptera) from Venezuela to Trinidad.

Dr. E. de Verteuil, who lives at Palo Seco on the south coast of Trinidad, informs me that some years ago, about the end of June or beginning of July, he was out boating about two miles off the south coast, and large numbers of horse-flies (*Tabanidae*) were seen flying full speed over the water towards Trinidad.

The Venezuelan coast is at this point about twelve miles away.

The above records make not the slightest claim to completeness, particularly with regard to references to other published records. In Trinidad many of the best-known periodicals are not available, and those references that are given are quoted largely from the local journals in order to bring them more readily before the student of insect migration.

Trinidad. *December* 1919.

VII. *An undescribed Lycaenid Butterfly from Cyprus,* Glaucopsyche paphos, sp. n. (Lycaenidae). By T. A. Chapman, M.D., F.R.S.

[Read March 3rd, 1920.]

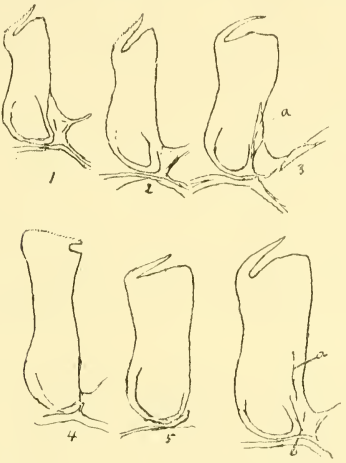
Plate V.

Mr. H. J. Turner has handed me some specimens of a *Glaucopsyche* from Cyprus. He mentions that there was some question as to whether they were *G. melanops*. I find them to be, so far as I can ascertain, a hitherto undescribed species.

They are very like *G. melanops* in size, and have a similar dark border to the wings on the upperside, but are of a darker blue, whilst beneath they are entirely without the marginal ocelli, which are always present, though not conspicuous in *G. melanops*.

In reality the species, for which I propose the name of *Glaucopsyche paphos*, is very close to *G. charybdis*, and may perhaps be best defined by comparison of its characters with those of that species. It is smaller than *G. charybdis*; the largest male before me, with which the largest female agrees in this respect, has an expanse of 30 mm., the smallest 28 mm. *G. charybdis* in my very short series varies in expanse from 32 to 35 mm. The colour of *G. paphos* is a very dark blue, and a dark border to all the wings, often very marked, is always present. *G. charybdis*, on the contrary, is of quite a pale blue. It also has a dark border, but this is very narrow and well-defined; in *G. paphos* it is usually ill-defined and tends to extend along the veins. The spotting of the underside, where one expects to find some distinctive character, does present one such character, but broadly the markings in both are identical. In both species the five large spots on the upper-wing may or may not be increased by one or two more of varying size. The fourth spot may be displaced outward from the regular curve that is typical, apparently more frequently in *G. paphos* than in *G. charybdis*. The spots on the under-wings present the 1st, 2nd, and 3rd nearly in line, then the 3rd to 6th in a regular curve, the 7th and 8th as a

pair near the hind margin, and the 9th close to the inner margin; the variations are that the 2nd may be moved basally so as to be out of line with the 1st and 3rd; the 4th may be moved out so that it is in line with the 1st, 2nd, and 3rd; the 7th, 8th, and 9th vary much as to size and even as to presence and absence. I find, however, one invariable difference; in *G. charybdis* the



Rough sketches of clasps of 1, *Glaucopsyche paphos*; 2, another specimen of *G. paphos*; 3, *G. charybdis*; 4, *G. melanops*; 5, *G. couperi*; 6, *G. cyllarus*.

7th, 8th, and 9th are in a row, each being about the same distance from the base, but in *G. paphos* the 9th is moved towards the base by a distance about three times that between the 7th and 8th. Neither species has any marginal markings (representing ocelli) to the hind-wings as occurs in *G. melanops*.

The upper surface of the ♀♀ is black; in one specimen there is some blue scaling on the hind-wings, strongest towards the hind margin. The ♂ appendages of *G. paphos*

are of the same type as in the rest of the genus *Glaucopsyche*, though with a distinguishing character that does not, I think, preclude their belonging to it.

On Plate V are photographs of the appendages of *G. paphos* and *G. charybdis*. Very good figures of the appendages of *G. cyllarus* and of *G. melanops* will be found in Tutt's "British Lepidoptera," vol. xi, pl. xxxi (p. 299), these being the only European species of the group.

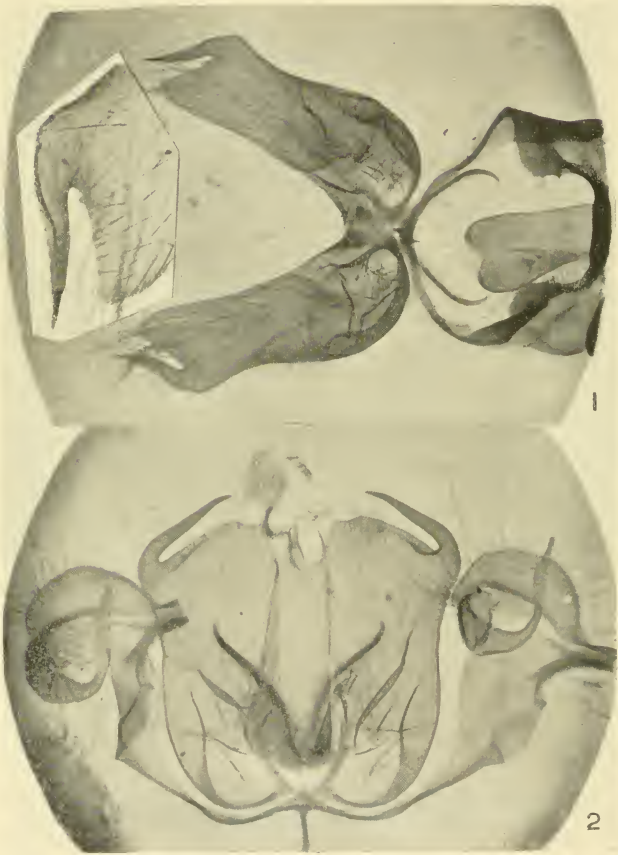
I figure here rough camera sketches of the clasps of these four species, and also of *G. couperi*, an American species. The few other species I have examined, such as *G. lygdamus* and *G. lycormas*, have clasps very close to those of *G. couperi* and *G. cyllarus*.

The form of clasp, with spine parallel to distal margin, is characteristic of *Lycaena* and *Glaucopsyche*. The two genera may be distinguished by the myrmicicole habits of *Lycaena*, *Glaucopsyche* living on ordinary vegetarian diet.

The clasps sketched show the spine to be smooth on both margins in *G. charybdis*, *G. couperi* and *G. cyllarus*, as it is in other species of *Glaucopsyche* mentioned, such as *lycormas* and *lygdamus*. The new form from Cyprus is the only one I have met with with the distal margin toothed.

G. paphos has the clasp narrower than in the other forms, the distal end is markedly oblique, in the others it is so slightly so, as to allow the clasps to be described as approximately rectangular. *G. charybdis* has a flange-like ridge (marked *a* in sketch) and the same ridge is seen in *G. cyllarus*. This is really a slight fold or fullness, marking the line of one of the attachments of the clasp to its base. It is absent in other species such as *G. couperi* and *G. paphos*.

The figure of *G. melanops* is given on account of the close resemblance of *G. paphos* and *G. charybdis* to it. Yet the clasps certainly suggest that *G. melanops* should be in a distinct genus. In this connection I should like to comment on an opinion I appear to have held in 1910, as reported in Tutt's "British Butterflies," vol. xi, p. 299. I there suggested putting *G. melanops* in *Lycaena*; this is obviously inadmissible, as it is not myrmicicole and the form of the clasp is also strongly against it. The latter character, no doubt, appears to forbid its being a *Glaucopsyche* (type *lygdamus*). I propose nevertheless to leave it



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♂ GENITALIA OF *GLAUCOPSYCHE* (1) *PAPHOS* and (2) *CHARYBDIS*.

for the present in *Glaucopsyche*, until further grounds for giving it a new genus appear. I may add that the appendages of *astraea* (placed in *Glaucopsyche*, l.c. p. 300) show that it cannot belong to this genus.

Explanation of Plate V.

Fig. 1. Male appendages of *Glaucopsyche paphos* × 40. Inset photograph of spine × 80 to show teeth.

2. Male appendages of *G. charybdis* × 40.

The breadth of the clasp of *G. charybdis* makes the well-developed spine appear short; its distal ventral angle beyond the spine is hollowed.

The dorsal armature of *G. paphos* is unfortunately not shown; its differences from those of *G. charybdis* are not so marked as those of the clasps; the falces appear to be rather more robust than those of *G. charybdis*. There seems to be some difference in the aedeagus, but as I have not mounted these separately, I cannot with my few examples be sufficiently sure of any item to describe it.

Mr. Turner proposes to place the type specimens in the British Museum.

VIII. *The Butterflies of Cyprus.* By Henry J. Turner, F.E.S.

[Read March 3rd, 1920.]

The late Mr. A. E. Gibbs contemplated a paper on this subject, and had frequently discussed the fauna of Cyprus with me.

The acquisition of a very large number of Cyprian butterflies subsequent to my friend's death showed me that almost every species had special peculiarities distinguishing it from the forms of the same species on the mainland of Syria and Asia Minor, and from the forms known from other parts of the Mediterranean littoral.

From 1907 to 1912 Sir John A. S. Bucknill was Judge-Advocate of the Island, and although most of his leisure was devoted to the special study of Ornithology, he was able to pay a little attention to the Lepidoptera, and in the British Museum cabinets will be found the insects which he then collected. In 1912 he was moved to Hongkong and subsequently to the Straits Settlements, but in the year 1916 he wrote out his notes at length with the view of getting them published in the "Proc. Zool. Soc." For some reason or other the paper was not read at that Society, and by the kindness of my valued correspondent, Mr. G. F. Wilson of the Chief Secretary's Office in Cyprus, I have been able to make copious extracts from it and embody them in the present paper.

In the introductory paragraphs of his MS., which deals with the Lepidoptera as a whole, Sir John Bucknill sums up the work previously done as follows (so far as it relates to the Rhopalocera):—

"In 1853 Julius Lederer sent a collector—one Franz Zach—to Cyprus; he seems to have made Larnaca his headquarters, and to have travelled in that neighbourhood and to the centre of the Island; I do not know how long he remained, but he appears to have been there at any rate in May. Lederer expressed himself as very dissatisfied with Zach's mission, because 'the vicinity of Larnaca where Herr Zach, after having travelled four weeks, arrived was found bare; water very scarce and the soil

chalky and almost devoid of vegetation; and an excursion to the centre part of the Island was equally unsuccessful.' Zach, however, obtained nearly forty species of butterflies and over fifty species of moths, and Lederer published an account of his visit in 'Verhand. z. b. Ver. Wien,' vol. v (1855).

"In 1887 and 1888 Dr. F. H. H. Guillemard made two ornithological visits to the Island, and in the papers which he published in the 'Ibis' for 1888 and 1889, descriptive of his extensive itinerary, he occasionally makes casual mention of some Lepidoptera; but his observations were not, I think, intended to be regarded as of scientific accuracy.

"In the late 'nineties an Austrian subject residing at Larnaca—a Mr. C. H. Glazner—sent a number of specimens to Lord Rothschild's Museum at Tring, and some of his records are noted in the later volumes of the British Museum Catalogue.

"In 1901 and 1902 Miss D. M. A. Bate collected some Lepidoptera, which were received by the British Museum.

"Mr. T. Bainbrigge-Fletcher seems, not very long ago, to have made a collection in the Island.

"Mr. (now Major) P. P. Graves, sometime correspondent of the 'Times' at Constantinople, has informed me that a Mr. Marsden collected in Cyprus comparatively recently.

"Personally my collecting was principally done in the neighbourhood of Nicosia, but I spent three midsummers (from July 1st to Oct. 1st) on the Troödos (the southern) range at an elevation of between 5000 and 6000 ft., and occasionally made short periodical visits to Kyrenia, Limassol, Larnaca, Famagusta and Paphos."

He goes on to remark:—

"There is a great variety of trees, shrubs and flowers on the lower slopes of the southern range, and I often wished I had been able to pay this ground a visit, to which a journey in April would, I feel sure, be of value. On the higher ground there is less verdure, but some interesting insects occur there, notably the handsome *Dryas pandora*, *Limenitis camilla* (*rivularis*) and *Libythea celtis*.

"The northern range is a good ground for 'Blues,' and it also gave me *Ypthima asterope*, *Cigaritis zohra* (= *acamas*), and *Glaucopsyche melanops* (= *paphos*).

"*Charaxes jasius* and *Pararge roxelana* occur locally in the plains, as does *Thais cerisyi*.

"It is interesting to note that silk-worms were introduced into Cyprus in the sixth century in the reign of the Emperor Justinian I."

The Island is somewhat square in shape, having a range of mountains bordering the northern shore and a second range in the south of considerably greater height, with the extensive mountain knot of Troödos over 6000 ft. in elevation, while between these lies an extensive plain from east to west right across the Island, an area which all the summer is very hot and dry, almost a desert.

Standing as it does at the junction of the S. European Mediterranean area and the converging lines of palaearctic and tropical Asian influence, Cyprus must needs be most interesting from a faunal aspect. The bulk of the species are European, most of them variants of the commoner species of the Central Mediterranean littoral, such as *P. machaon, P. brassicae, P. rapae, P. daplidice, A. crameri* (*belia*), *E. cardamines, G. cleopatra, C. edusa, S. hermione, S. briseis, H. semele, P. aegeria, P. megera, P. maera, C. jasius, L. rivularis, P. atalanta, E. polychloros, D. pandora, L. celtis, B. quercûs, R. phlaeas, S. baton, A. medon, P. icarus, C. argiolus, C. alceae,* and *T. acteon.* While from the Asiatic side are derived *P. chloridice, Y. asterope, S. anthe, S. anthelea, S. roxelana, E. telmessia, E. lupinus, C. thersamon, L. boeticus, T. balcanicus, S. telicanus, C. trochilus, C. phiala, G. paphos, C. acamas, G. nostrodamus* and *P. mathias. D. chrysippus* may be either Asian or African in its immediate origin, as also may *S. telicanus, P. mathias* and *C. acamas.*

Taking a negative view, exclusive of the unconfirmed records of more than sixty years ago, there is an absence of Hesperias, Erebias, Brenthids, Argynnids (1), Melitaeids, Ruralids (1), Lycaenas, Plebeiids, *Agriades*, etc., and of truly tropical species except *L. boeticus,* which is very common.

I am much indebted to my friend Mr. G. F. Wilson of Nicosia for the very large amount of material he has so kindly collected for me during the last three years, and also for furnishing me with practically all the previous records of the Rhopalocera of the Island. My best thanks must also be accorded to Sir John A. S. Bucknill for permission (through Mr. G. F. Wilson) to make use of copious extracts from his MS. records. For the numerous suggestions and notes on the unconfirmed records and on the

more obscure species, I owe very much to Major P. P. Graves of Constantinople, whose knowledge of near Eastern Lepidoptera is from personal experience recent and reliable. And not less am I indebted to the acumen of Dr. Chapman for his kind help and advice, especially so for the separation of the new species *Glaucopsyche paphos* from *G. melanops*, for the confirmation of *E. telmessia* in place of *E. jurtina* (*hispulla*), and of *C. phiala* in place of *Z. galba*.

In the following notes J.A.S.B. = Sir J. A. S. Bucknill, A.E.G. = A. E. Gibbs, G.F.W. = G. F. Wilson, T.B.-F. = T. Bainbrigge-Fletcher.

Papilio machaon L. [race **asiatica** Mén. = **sphyrus** auct.; ab. **cypria** Vrty.].

"Recorded by Lederer. I found it very common. I was informed by Major P. P. Graves that a form from Nicosia has been separated as peculiar to Cyprus."—J.A.S.B., 1916.

"Only a few have been sent. One from Nicosia in June is the summer form with broad band to which the discal spot is joined. This used to be called *sphyrus*, but I suppose we must now call it *asiatica* Mén., or *sphyroides* Vrty. Verity says that there is in Cyprus a small race of *machaon* which is peculiar to the Island, as there also is of *P. brassicae*."—A.E.G., 1916.

"Common in the plains from March to October. Met with rarely in the mountains. There appear to be three broods, in February, April and September."—G.F.W., 1918.

The fairly long series received show more ground-colour than the British race, and the yellow is decidedly richer, although not so rich as in the form *aurantiaca* Spyr. In size the race is considerably above the average British form; one female measures just over 100 mm. in expanse.

According to Seitz ("Pal. Gr.-Schm.") the name *sphyrus* Hb., has been wrongly applied by dealers to specimens in which the marginal band of the hind-wing is wider and makes a close approach or meets the spot at the end of the cell, also having somewhat darker ground-colour. This is the form *asiatica* Mén. ["Cat. Mus. Petr. Lep.," I, 70 (1855)] and most of the Cyprian specimens are of this race. The true *sphyrus* figured by Hübner ["Ex. Schm.," 775–6 (1826 ?)] and refigured by Seitz [*l.c.*, I, 6 *d* (1906)] is a much paler form caused by the black marking being

very thickly dusted with yellow scales, with an increase of blue on the hind-wings both above and below, and of small size.

Verity in "Rhop. Pal." pp. 13, 108 (1905) describes a very small form of the *asiatica* race as *cypria* (*l.c.*, pl. iii, 1). The base of the fore-wing is more strongly powdered with yellow atoms, and the blue in the band of the hind-wing is considerably reduced. This form is evidently rare, as it has not been sent. All my specimens are of early May capture except a smaller not fresh specimen of April 1st. I take it, there are only two broods really, and that this last is a "precocious" specimen of the first generation to which my May specimens belong.

The tails strike one as being exceptionally long, especially for an island race.

Thais (Zerynthia) cerisyi Godt. [race **cypria** Stich. (1907)].

"Recorded by Led. I found it local, but in certain spots very common in early spring."—J.A.S.B., 1916.

"I took this to be the Asia Minor form *deyrollei* Obtr., but it appears to differ, and Stichel has called it var. *cypria*. The long series of both males and females appear to be a very uniform lot and to present very little variety."—A.E.G., 1916.

"Separated as var. *cypria* by Herr Stichel in 1907. Found, so far as I am aware, at only one spot in the Island, *i. e.* Aghirda at the foot of the Kyrenia Pass. Emerges during the first week in March, and flies till about the first week in April, when it disappears altogether. The males are fairly common at this spot, but females are not so easily taken owing to their sluggish habits. The males are continuously on the wing in the sun, but I have only taken the females by putting them up in walking."—G.F.W., 1918.

A long series of this species including a fair proportion of females has been received. They are very uniform in size, marking, and colour. In the males there are two shades of ground colour, some being very slightly duller than the rest; they show scarcely any aberration and much resemble the race *cretica* Rebel, from Candia, but are slightly larger, of not quite so white a ground, with somewhat increased markings, and have the tail remote from the anal angle developed, whereas in *cretica* all three tails are almost suppressed. While the type form has a

row of at least six red blotches on the margin of the hind-wing and *cretica* only the first and last of the row, *cypria* often has slight indications at least of one or two more. In fact, it stands intermediate between the type and *cretica*. The females are also pretty uniform, but show some aberration in the development of the red marginal blotches of the hind-wings, which in some specimens are only separated by the dark veins, and in others the lighter ground is also apparent on both sides of the dark veins. All the colours of the females are richer and fuller; they are darker and more marked than the females of *cretica*. There are no specimens of the race *deyrollei* Obthr.

[**Aporia crataegi** L.

"Dr. Guillemard mentions having met with this species in 1887. It was not recorded by Lederer; and I never saw it."—J.A.S.B., 1916.

"Recorded but I have never seen it."—G.F.W., 1918.

Has not been confirmed. Major Graves says (*in lit.*): "East side of Lebanon and Anti-Lebanon." Led. does not record it from Beirut.]

Pieris brassicae L. [race **catoleuca** Röber. (1896); ab. **nigronotata** Jach.; ab. **cypria** Vrty.].

"Recorded by Led. I found it abundant everywhere."—J.A.S.B., 1916.

"A specimen labelled '*rapae*' puzzled me. I thought for the moment it was *P. manni*, but the apex of the fore-wing was too acute, almost falcate. It then dawned upon me it was a quite small *brassicae*, which it proved to be. Verity proposes to call all these dwarf *Pieris* forms by the varietal name of *nana* to whichever species they may belong."—A.E.G., 1915.

"You have sent me two of these dwarfs. One of the ordinary-sized males sent has a small black discal spot on upperside of fore-wing. This is the var. *nigronotata*, and I believe it is not rare where it occurs, which is chiefly in the southern part of its range. I have it from N. Africa—I think Tunis. Your summer brood is interesting and almost as good as the Asiatic form, which has been called *catoleuca*; in fact, I think we may call them *catoleuca*. It is the females which have been given this name, for they have a very strongly marked upperside with very clear light hind-wing underside."—A.E.G., 1916.

"Common everywhere from March to October. Early broods have the under-wing much darker green than the summer broods."—G.F.W., 1918.

I have received a short series of the summer brood only, which has been named *lepidii* by Röber, but, as Verity points out ("Rhop. Pal."), quite unnecessarily, since the spring emergence has for many years had the name *chariclea* Steph.

The females in the series are all from Troödos, 4000–6000 ft., and are very large (the largest female 70 mm. in expanse), with intensely black markings, all large in extent. The apical blotch is very irregularly extended on the inner side; two of the "teeth" in some examples run along the veins to the large upper spot of the fore-wing. Both discal spots and the inner marginal streak are very large, the two former having more or less dusky clouding between them, while the lower spot is quite united to the inner marginal streak. Only one example has this streak obsolescent. At the base of the fore-wings there is a considerable amount of black dusting which extends along the costa and is there more dense. The underside of the hind-wings is uniformly pale yellow without any dusting of dark scales. The specimens seem to agree quite well with the Asiatic form named *catoleuca* by Röber. In the *catoleuca* in Seitz (I, pl. xix, *c*) there is an additional spot on the underside of the fore-wing (at the top). This is not present in the Cyprian form; Verity neither figures nor refers to this spot. Incidentally, I note, that the figure of *nepalensis* Verity ("Rhop. Pal.," pl. xxxv, 17) agrees exactly on the upperside with the Cyprian females, but it is stated to have a very considerable amount of dusting on the underside of the hind-wing. On the undersides of the Cyprian females the spots of the fore-wing have more rather than less black continuation marking between them.

The only male I have from Troödos is small, that is more of the typical size, and it is a *nigronotata* Jach., with the black "spot" (thin dash) on the disc of the fore-wing. The other males are from the plains, Nicosia and Platres. One of these is also an ab. *nigronotata*. In both these specimens this "dash" is situated midway *between* the veins as it is in *P. deota* from the Pamirs and in the ab. *cypria* figured by Verity ("Rhop. Pal." pl. xxxv, 14), whereas curiously in Verity's figure of *nigronotata* (*l.c.*, 11)

it is situated *along* a vein. My Cyprian males measure 66–70 mm.

Verity has named a very small form from Nicosia as ab. *cypria*, and gives the expanse as 45 mm. on the average. I have not had one sent.

Pieris (Ganoris) rapae, L. [race **leucosoma** Schwrd. (1905); vern. gen. **vaga** Früh.].

"Recorded by Led. I found it abundant everywhere."—J.A.S.B., 1916.

"An ordinary male spring form, which from its appearance might have been taken in the North of Europe."—A.E.G., 1916.

"Common everywhere from March to October: most plentiful in April and May."—G.F.W., 1918.

Only a few specimens have been sent, taken in Nicosia in March (♀s) and in April (♂s) and one ♂ from Troödos in July. They are of average size, of remarkably pale yellowish white on underside of hind-wings with no trace of dark powdering. Presumably the March–April specimens were of the first generation, *metra* Steph. In the males of this generation the discal spot is very faintly marked and the costal blotch of the hind-wing is scarcely traceable. In fact they conform tolerably well to the Syrian race *leucosoma* Schwrd., of which the vernal brood has been called *vaga* Früh. The Troödos male of July being of the summer generation is of course more plainly marked.

Pontia daplidice L. [race **persica** Bien.; ab. **minuscula** Vrty.].

"Recorded by Led. I found it very common everywhere."—J.A.S.B., 1916.

"Two ♂♂, both apparently summer brood, taken April and June. The former had a very lightly marked apex and very white wings, and was of normal size. The latter was a small specimen, which I attribute to the var. *raphani*, being much yellower below than the ordinary form. Both specimens had very small discoidal spots."—A.E.G., 1916.

"This species emerges in February in very small numbers. In May, however, they are abundant everywhere in the plains, and a few are to be seen on Troödos mountains up to about 5000 ft. A third very small brood emerges in September. The green underside varies greatly both in shade and design in the various broods; the green in the

earlier broods is dark and covers most of the hind-wing; later *daplidice* have the green very pale indeed, and very little of it, probably the var. *raphani*. *Daplidice* varies also in size a great deal, some specimens I have taken being no larger than a common blue."—G.F.W., 1918.

A long series, dates ranging from May 12th to mid-July. None of the early brood were received, hence none are of the *bellidice* Ochs. (spring) form if it be produced there. The earlier specimens (May) are of the ordinary *daplidice* form, *i. e.* neither extreme, but intermediate between the *bellidice* of spring in the northern part of its range and the summer *raphani* Esp., which is strong yellowish green on the hind-wing below. Most of the later specimens are of this last form with a good sprinkling of a form corresponding to the later summer race from N. Africa called *albidice* Obthr., in which the green is still more camouflaged by a paler yellow, the markings becoming obsolescent on the inner margin and base, and the veins more emphasised in yellow. This has been named *persica* Bien.

One underside aberration has the yellow approaching orange in richness without any diminution of marking. Another has the marking reduced so that there is a complete wide white band across the wing from costa to inner margin.

None of the specimens are large; a series taken at the same period in Catania are all much larger than any of the Cyprian examples. In fact, there seems a tendency to reduction in size, and one example is but a shade larger than a good-sized *Polyommatus icarus* and is the form ab. *minuscula* Vrty.; it was taken in July on Troödos.

Except in one specimen, a female, which has a slight yellow flush and approaches the ab. *flava* Obthr., the ground-colour above is a pure white. There is but little trace of the greenish yellow at the base of the fore-wings below, a character noticeable in some of the southern races.

Most of the males have the discoidal spot on the fore-wing somewhat small, contrasting with that of the females which is generally somewhat large. One male has a spot developed in the anal angle of the fore-wing above, a characteristic feature of the female. As a rule the males have absolutely pure white hind-wings with no trace of markings, a few only have the costal blotch developed, and a few are dark-scaled along the ends of one or two of the veins near the apex.

The females are extremely uniform; a good proportion

of them have an incipient dark scaling connecting the anal spot on the fore-wing with the extended apical markings, an aberration I have not noted in series received from elsewhere.

Pontia chloridice Hb.

"Major P. P. Graves informs me that this species was taken in Cyprus by Mr. Marsden."—J.A.S.B., 1916. (Not recorded by Led.)

"In 1918 for the first time, I took a few examples near Platres at which locality it was once before recorded many years ago."—G.F.W., 1918.

These few specimens were sent to me, and this year (1919) another came, taken on the plains near Nicosia. They are typical except that the last specimen has the underside of the hind-wing considerably paler; it is a female taken on May 18th, the others were taken on July 7th. Probably the two broods are represented, normally the spring brood has the darker green underside. The specimens are the worse for wear, and the suggestion is that they are immigrants from the mainland.

Anthocharis crameri Btlr. (**belia** auct.) [group **ausonia** Hb.; race **taurica** Röb.].

"Led. recorded the form *ausonia*. I obtained what was identified at the Brit. Mus. as *belia*. The Report of the Cyprus N.H. Soc., 1912–13, records the capture of *belia* var. *taurica*."—J.A.S.B., 1916.

"Much lighter below than my series from S. France, but apparently flying about the same time (March). Six specimens."—A.E.G., 1915.

"My latest specimen of *belia* is April 10th. Does it fly later? There seems to be a curious overlapping of *belia* and var. *taurica*. The latter is, of course, summer brood, but I have one specimen March 9th. In many respects it resembles *taurica*, but I think it must be an aberrant specimen of *belia*. Your *belia* is *crameri(a)* of Butler as far as I can make out at present."—A.E.G., 1916.

"Emerges in February and flies until the end of March, when its place is almost immediately taken by the summer form, in fact I have taken old *belia* and fresh var. *taurica* together; there seems to be a curious overlapping. *A. belia* is found in small numbers all over the plains in barley fields where the mustard plant grows; v. *taurica* is much

more abundant, also in the plains, but I have also taken this species rarely on Troödos during June and July."—G.F.W., 1918.

This common Mediterranean species, to which between thirty and forty varietal and aberrational names have been applied and more suggested, is a very difficult one to deal with. The name *crameri* Btlr., has now authoritatively replaced the name *belia* Cr. et auct., by the decision of the British Nomenclature Committee.

Dr. Verity in "Rhop. Pal.," pp. 171–5, divides the various races into two groups which he designates the *ausonia* Hb., and the *occidentalis* Vrty., groups. The former, to which the Cyprian race belongs, he diagnoses by the following comparative characters. Apex of fore-wing wide; hind margin slightly convex; markings black powdered with white scales giving a more or less grey appearance; the discal spot at the end of the cell narrow and generally of an irregular **S** shape; the costa with few if any striations; the underside of the hind-wing bright green, distinctly bordered with more or less yellow, generally more, and very irregular in contour with a tendency for the white spaces to become marked and suffused with yellow, in fact it is aptly remarked that the bands and spots of white are so indefinite and irregular in shape as to be scarcely capable of definite description; and finally the white has the tendency to a nacreous appearance in only one or two of the earliest specimens to emerge.

The *ausonia* group is made up of races from Asia Minor (Smyrna is the locality of the type of *crameri*), S. Russia, the Balkans, Greece, and S. Italy, including Sicily.

The dates of capture of my Cyprian specimens are (eighteen different dates) from February 13th to May 14th. The longest gap between the dates, being of twenty days between March 25th and April 14th, is probably approximately the time between the two broods. All the specimens come from Nicosia in the middle of the central plain and from Aghirda just at the foot of the northern range of mountains.

When the specimens are arranged according to date of capture the two extremes are easily separable by numerous characters, particularly by those on the underside of the hind-wing. The specimens of the latest dates are very decidedly yellow on the hind-wing below with a minimum of green, the apex of the fore-wing being yellow only; the

pattern is extremely indefinite as to shape and direction, with the yellow much suffused and running into the white irregularly. The earliest examples are much greener and the pattern has a certain amount of definition, the yellow is less irregularly suffused, and there is a tendency to a nacreous appearance in some of the more defined white areas. The later specimens are generally speaking much larger, and the striations on the costa fore-wing, never much in evidence, are practically absent. The discal blotch in the earlier specimens is not nearly so heavy as in the later emergence. As noted above by A.E.G., there is much overlapping, but the general advance from the early spring (*ausonia*-like) to the later emergence, to which the name of *taurica* has been given by Röber (Seitz), is well demonstrated by the undersides of the series when arranged according to dates of capture, although it is impossible to draw a definite line of separation of the two forms. I doubt if the earliest spring form as exemplified in the *occidentalis* group (France, Spain, etc.) ever occurs in the Island, *i. e.* the deep green underside hind-wing with strong nacreous interspaces.

Euchloë cardamines L. [ab. **turritis** Ochs.; ab. **minor** Ckrll.; ab. **phoenissa** Kalchb.].

"One thing that struck me was the presence in one or two *E. cardamines* of a black dusting forming almost an edging on the inner margin of the orange apical spot in the males (no females sent)."—A.E.G., 1915.

"Some of your specimens are very small, as are the Sicilian ones. They appear to prevail in the Mediterranean Islands, while they are rare with us. But the chief point of interest about *E. cardamines* is, I think, the dark inner margin to the orange apical spot. One you have sent me has quite a distinct black border to the orange tip."—A.E.G., 1916.

"I obtained this fairly commonly in spring."—J.A.S.B., 1916. (Not recorded by Led.)

"This is a very local species; I have seen it only at a few spots on the Kyrenian mountains. Emerges in early March and flies till the middle of April. Mr. Gibbs thought that there was a variety of this species, and some specimens I sent him had a distinct black dusting on the inside edge of the orange colouring. Males are not uncommon, but the only female I have ever seen in Cyprus, previous to

1918, I sent to Mr. Gibbs in 1915. But in March 1918 this species was particularly common, and I took some ten females."—G.F.W., 1918.

Only a comparatively few specimens have been received, but amongst them are a remarkably small form of which the males measure only 26·5 mm. and the females 27 mm. This is the form ab. *minor* Ckrll. The specimens generally are a small race; among them are several of the ab. *turritis* Ochs., in which one side of the discoidal spot has emerged from the orange apical area and is contiguous to the white general ground-colour. Several examples have dusky scales sparsely scattered along the inner margin of the orange apical blotch, and thus are the incipient stage of the form known as ab. *phoenissa* Kalchb. One male has only a minute dot for the usually well-defined discal spot fore-wing. In the females there is a tendency for the hind-wings to become yellow on the upperside. In all the specimens the orange is comparable in extent to that of our British race (*britannicae* Vrty.) in not extending to the anal angle, but terminating abruptly some distance from it, whereas in the Riviera race it curves down and terminates at the anal angle or even on the inner margin.

[Gonepteryx rhamni L.

"Dr. Guillemard reports having met with this insect in 1888, but probably it belonged to the next species; I did not see it."—J.A.S.B., 1916. (Not recorded by Led.)

"Recorded, but I have never seen it."—G.F.W., 1918.

This record appears to be an error. A large number of specimens of *G. cleopatra* have been received, but of not one had I the slightest doubt.]

Gonepteryx cleopatra L. [race **taurica** Stgr.].

"Led. records it. All the specimens of this species, which was very common, were identified by the B.M. as var. *taurica* Stgr."—J.A.S.B., 1916.

"*G. cleopatra* v. *taurica* is interesting. I have compared it with specimens from several regions, and the nearest approach I have is one I took in the Balkans. The ground-colour of *taurica* is said to be lighter than the usual form, but I cannot see much difference in this respect though the orange suffusion is certainly less than in any other forms I have seen. My most strongly marked specimens are from Morocco."—A.E.G., 1916.

"A fairly common species of three broods; the first emerges towards the end of February, the second and larger brood at the end of May, and a very small brood in October. A few are found in the plains generally in flower gardens, but the largest numbers occur in the mountains usually near small streams and among the bracken. Females are comparatively rare."—G.F.W., 1918.

In Seitz, "Pal. Gr.-Schm.," I. pl. 24, the figure of race *taurica* shows but slight, if any, diminution of the orange flush on the fore-wing; on the other hand Verity, "Rhop. Pal.," pl. xlviii, figures *taurica* as having only the slightest amount of this flush. In the Cyprian race the extent of the orange agrees with neither figure, but lies midway between in amount with a balance towards the larger. In some of the females there is a slight indication of the male ground-coloration around the outer margins of both wings, but especially at the tips of the fore-wings, and in one specimen this suffusion extends somewhat strongly over the whole hind-wing. The size of the discoidal is uniformly small on all wings. The orange is somewhat paler than in the type form, possibly owing to its more graduated fall in depth of colour along the outer margin. I do not think that the ground-colour is really lighter except that the females appear whiter, which is possibly caused by the influence of the light undersides.

As to the question of three broods, Verity asserts definitely, "Rhop. Pal.," that with the Italian races there are three generations, which are clearly separated by intervals of a month or two, during which no individuals may be observed, except that individuals of the autumn (3rd) emergence hibernate and may be met with all the winter. The dates of my Cyprian specimens are from March 5th to July 21st, with a very definite interval of seventy days between March 5th and May 14th, and another between June 20th and July 21st of thirty-one days, but this latter may be qualified by the fact that the July specimens were taken high up on the Troödos mountains and probably belong to the summer (2nd) emergence. The March specimens are quite fresh and have apparently not hibernated. All but the Troödos captured specimens are from the lowlands. So far I have no examples of the autumn brood. Röber (Seitz), "Pal. Gr.-Schm.," very strongly doubts the existence of three broods or even two, but the long definite intervals during which no individuals

are ever found and the excellent condition of the specimens when captured seem to be against this opinion, and certainly in Cyprus the evidence of G.F.W. would seem almost conclusive. The October-caught specimens are probably a "precocious" emergence of the early spring brood.

Colias edusa Fab. 1787 (**croceus** Fourcr., 1785) [ab. **helice** ♀, Hb.; ab. **helicina** Obthr.; ab. **aubuissoni** Crdj.; ab. **faillae** Stef.; ab. **obsoleta** Tutt].

"This species I found in great abundance; many curious pale forms were taken, and ab. *helice*."—J.A.S.B., 1916. (Recorded by Led.)

"Very common from March to November, occurring both in the plains and in the mountains; varies greatly both in size and marking. The yellow colour also varies in shade, some specimens being quite dark and others almost lemon colour. Var. *helice* is not common. Occurs both in the plains and on the mountains during April–June. Rarely seen on the wing and not often taken."—G.F.W., 1918.

The Cyprian race is a little above the average in size. Several examples, both males and females, are of the pale orange or lemon colour to which the name *helicina* Obthr., applies. The hind-wings generally have somewhat more dusky suffusion than in the type, and most specimens have the black hind-marginal band of the fore-wings with the veins towards the apex conspicuously outlined with yellow, one or two being ab. *faillae* Stef., with all the veins so emphasised. A few females, having only traces of the lighter markings in the hind-marginal band, are transition to ab. *obsoleta* Tutt. Several very fine var. *helice* Hb., have been sent, including one which has a slight orange suffusion over the fore-wings with hind-wings of the ordinary typical female coloration, orange with dusky suffusion, and having a large well-developed discoidal spot conspicuous by its deep orange colour, an intermediate form, to which Caradja has given the name *aubuissoni*. One or two var. *helice* have white rings around the hind-wing discoidal. Another female is remarkable in having on each fore-wing two "blobs" of dusky scales starting at the middle of the base and reaching nearly half across the wing, a unique aberration, I believe. The same specimen has an unusually large and conspicuous discoidal spot on the hind-wing. The undersides are very uniform

in colour and marking, only one has the ground of the hind-wing below of a bluish colour.

Danaida chrysippus L.

"Recorded by Led. as occurring from the middle of May throughout the summer. It seems rather capricious, however, in its appearance, and I first met with it in 1911. It was then scarce, but since then has been, I am told, abundant. The larva feeds on fennel which is only locally common."—J.A.S.B., 1916.

"These are quite ordinary forms."—A.E.G., 1916.

"The records of this species are curious. It was recorded in 1853 and in 1888, after which date it appears to have vanished from the Island until 1911, when a few made their appearance at Kyrenia near the sea. From 1912 to 1914 they were fairly common at Kyrenia, and a few were to be seen inland in the plains; in 1915 and 1916 very few were seen; I saw none in 1917, but they reappeared again in 1918."—G.F.W., 1918.

Ypthima asterope Klug. [ab. **inocellata** Strand].

"I found this species fairly common on the northern range. The ocelli seem to show much individual variation."—J.A.S.B., 1916. (Not recorded by Led.)

"It is the Asia Minor form as is to be expected. All the specimens came from the northern range. Is it not found elsewhere, and is not confined to the mountains? My specimens seem to have come from altitudes between 1200 ft. and 3000 ft. They vary a little in spotting from some without ocelli to others with three. All the Satyrids vary in this way."—A.E.G., 1916.

"Rather a rare species. I have only found it near the Aghirda Pass among the rocks during March and April. The ocelli show much individual variation."—G.F.W., 1918.

Some half a dozen examples only have been received of this species so extremely variable as to the number and development of its eye-spots. It may be noted here that Seitz's, "Pal. Gr.-Schm.," "I, pl. 34 *a*," figure is not *asterope*, but *baldus*. There are several figures of the African races of this species *l.c.* vol. xiii, pl. 29. In the Asiatic dry-season form, to which the Cyprian race belongs, the eye-spots are very much suppressed. One example may be called ab. *inocellata* Strand, as being quite destitute of eye-

spots both above and below except of course the invariably present apical bipupillate spot on the fore-wing.

Satyrus hermione L. [race **cypriaca** Stdgr.].

"*S. hermione* v. *cypriaca* is a fine form and very distinct."—A.E.G., 1915.

"They are a very even lot with slight variation of spotting. They come from both ranges. Are they confined to the mountains?"—A.E.G., 1916.

"Led. recorded this species, but remarked of it that 'the bands are hardly half the width which they are in our (S. European) specimens, and in the ♀s are almost as in the ♂; the hind-wings are light whitish grey on the underside.' Seitz figures the Cyprus form as *cypriaca*, Stdgr. It is quite common."—J.A.S.B., 1916.

"A fairly common species, but confined to certain localities. It occurs on the Kyrenian mountains and in the woods between the Kyrenian range of mountains to the northern sea coast. There are none south of the range until the Troödos mountains are reached, where they again occur at altitudes of about 3000 ft. and over. On the Kyrenia range it emerges in May and on Troödos in July and August. Found chiefly on the trunks of olive and carob trees on the Kyrenia mountains and on pine trees on Troödos, and occasionally among rocks."—G.F.W., 1918.

A large number were sent, all of them were of good size, very dark, and rich in coloration. There are no typical forms and none which can be called race *syriaca*, Stdgr., which are distinguished by a narrower band on all the wings in both sexes, and obsolescence of it at the angle of the hind-wing. Race *cypriaca*, Stdgr., is still darker and the bands on all wings nearly obsolescent. In the male the band is traceable as a narrow and somewhat less dark sub-marginal area suffused with the dusky coloration and crossed by the wing veins widely enlarged by scales of the same dark colour as the general colour of the wings. The fringes are clearly light and dark chequered. The apical eye-spot of the fore-wing is very faint and occasionally has the white pupil non-existent. In the female the band of the fore-wing is much narrower than in the type and divided into blotches by the widely emphasised wing-veins. The apical eye-spot is usually well developed, but one or two examples are without the pupil. On the

hind-wing the band is almost wholly obsolete in the anal half, and the rest macular, more or less dusky, and much narrowed. The undersides are marmorated, giving a bark-like appearance to the under surface. The outer area of fore-wing underside is yellowish, the band of the hind-wing below is covered by striations and speckles, while the basal area has much lighter markings, so that there is scarcely any difference between the basal and outer areas so well-marked a feature in the type, but they are separated by a wide deep black line. There is often a small eye-spot midway towards the anal angle of the fore-wing in both sexes.

Satyrus briseis L. [race **fergana** Obthr.; ab. **pirata** ♀, Esp.].

" Led. recorded this species and also var. *pirata*. I found both at Nicosia, the latter being much the less common."—J.A.S.B., 1916.

" *S. briseis* seems mostly from the lower levels and var. *pirata* wholly so."—A.E.G., 1916.

" Var. *fergana* is a fairly common species in the plains and at the Kyrenian Pass. I have taken two or three specimens on Troödos at about 5000 ft. Emerges in May, and is fond of rocky places, small caves and river banks, but taken sometimes on the flower of the common thistle. Var. *pirata* is of the same habits and frequents the same locality as the preceding form, but is rare. I saw one on Troödos in 1918."—G.F.W., 1918.

A long series sent all of large size with very little difference in expanse of male and female. All are of the race *fergana* Obthr., which is the largest and has much rich reddish brown of different shades on the underside of the fore-wing, with well-developed white discal bands on the upperside of both wings. The second eye-spot in the submargin is often obsolescent, being only represented by a more dense spot in the general dark ground, with occasionally a small white pupil. In the female it is usually more apparent. One male has this spot very definite owing to the extension of the white band on the marginal side of the spot, a very unusual occurrence in this sex. The apical spot of the female fore-wing is often destitute of pupil. The underside of the hind-wing in the male has clear white ground partially covered with soft grey, with strongly marked costal and inner marginal blotches, the contrasts being abrupt and strong. In the female

there is a prevalence of the soft grey mottled with darker grey, but not uniformly so, as in most of the Central European forms. Across the wing in this sex run two wide bands of darker shade, deep and abrupt on the outer side, but dissolving more or less into the ground on the inner, and tinged with a rich brown. The inner band is sometimes interrupted in the middle and may have none of the lighter mottled ground of the basal side of it. Some of the females of the *fergana* form show slight traces of the reddish brown on the outer margins of the irregular white band above, an incipient stage of the very fine ♀ ab. *pirata* Esp.

The ab. *pirata*, of which a short series have been sent, has the band on the upperside of a bright reddish ochreous colour. This form is somewhat larger than the *fergana* female, and one or two examples are without pupils to the eye-spots. There is a curious parallelism between *S. briseis* and the Spanish species *S. prieuri* Pier., both species possessing a reddish-ochreous form of the female, which in the latter species is known as ab. *uhagonis* Obthr., and is also a very large and strong-looking insect.

Satyrus anthe Och.

"I found this species but not very commonly. I took one specimen on the southern range at over 6000 ft. up."—J.A.S.B., 1916.

"A very rare species met with on Troödos at 5000–6000 ft."—G.F.W., 1918.

Hipparchia semele L. [race **mersina** Stdgr.; ab. **triocellata** Rag.].

"I found this species common, and specimens which I sent to Tring were there identified as the form *mersina*."—J.A.S.B., 1916. (Not recorded by Led.)

"*H. semele* v. *mersina* is very evenly coloured below and different from any form I have."—A.E.G., 1916.

"A common species occurring everywhere from April to August. Found both in the plains and on the mountains. In the mountains it usually rests on pine trees, and in the plains it is found among rocks."—G.F.W., 1918.

The *mersina* form is much larger than the British race in both sexes, and the males are only slightly smaller than the females. In general coloration a long series strikes one as darker than any other race. The females

are especially dark on the hind-wings, and there is an absence of the tawny shade in the disc of all the wings. The lighter markings are not of the ivory yellow of the type nor of that of the bright Spanish race, but have a reddish suffusion. In the hind-wings this reddish shade is restricted to a series of submarginal wedges of moderate size, somewhat more pronounced in the males, which have also some lighter shade in the ground, generally, a character hardly apparent in the females. The eye-spots are almost invariably white pupilled, well formed and in the normal number, only one example approaches ab. *triocellata* Ragusa, with an unpupilled spot between the two normal eye-spots on the fore-wing.

On the underside of the fore-wing the ground-colour is a rich tawny, not in any example the ivory yellow of the type; there is but little dark separation between the discal and submarginal areas, these being practically continuous as in the form *algirica* Obthr. On the underside of the hind-wing there is a predominance of gray mottling, and scarcely a specimen shows the tawny or black shade markings of the British race. In the female the basal and submarginal areas are almost the same in depth of marking and marbling, but more or less divided by a blackish line, none too well emphasised. The mottling is very uniform over the wing, but coarse. None of the males have the strong tooth in the central line which is so prominent a character in the females. Most of the males have the basal and submarginal areas clearly separated by a light transverse band outside the blackish transverse line, which band shades off gradually into the gray mottling of the outer marginal area. In this respect one female only approaches the male.

Hipparchia anthelea Hbn.

"I found this species common on the southern range up to its highest altitudes."—J.A.S.B., 1916. (Not recorded by Led.)

"Fairly common on the Troödos range of mountains, May–July. I have taken a very few specimens on the northern range. Difficult to take as it is always among large rocks."—G.F.W., 1918.

A long series shows but small variation. One male and one female have an additional black spot on the fore-wing below the fourth from the apex. Another female has a

considerable intensification of coloration over the whole surface. Still another has a dark ring developed around the second white spot of the fore-wing. And several females have the usual sharp-pointed extension of the tawny band of the fore-wing into the disc more or less undeveloped.

Pararge aegeria L.

"I found this species fairly common."—J.A.S.B., 1916. (Not recorded by Led.)

"Not a common species, occurring both in the plains and on the mountains, generally near streams of water. April–September."—G.F.W., 1918.

Of the few which have been sent all have been typical *aegeria* with very minor aberration only, such a series as might have been obtained, say, at Hyères. Not one showed an approach to the brilliant specimens obtainable in Algeria, etc.

Pararge roxelana Cram.

"Recorded by Led. I found it locally; it frequents the tops of the carob trees."—J.A.S.B., 1916.

"A rather rare and very local species only occurring in the mountains at the Kyrenian Pass and at Troödos. Found in carob trees and in thick hedges, very rarely in the open, therefore very difficult to take. May–July."—G.F.W., 1918.

A short series very uniform in size and marking have been received. One male has an additional eye-spot on the underside fore-wing below the apical eye-spot. I note that the light discs above and below the apical eye-spot are more pronounced than in the Syrian form.

Pararge megera L. [race **lyssa** Hb.].

"Recorded by Led. I obtained it commonly; specimens were identified at Tring as var. *lyssa*."—J.A.S.B., 1916.

"A first brood of this rather uncommon species emerges in March, and another in May. Found in the plains and on the mountains in small number."—G.F.W., 1918.

The short series received appear to be all of the S. European form *lyssa* Hb., in which the underside of the hind-wing is grey instead of showing the dark-brown suffusion of the type. This character is more pronounced in the summer brood than in the earlier brood in which

specimens occur which approach the more northern typical coloration. The uppersides are very uniform in marking in both sexes, and there appears to be no difference in size, colour, nor marking between the two broods so far as my small series shows.

Pararge maera L. [race **orientalis** Stdgr.].

"Led. records the form *adrasta*. I obtained specimens of both forms. Miss Bate obtained the species in 1901."—J.A.S.B., 1916.

"I think *P. maera* are Staudinger's var. *orientalis* rather than true *adrasta*."—A.E.G., 1916.

"Found in the plains and on the mountains in small numbers. The first brood of this rather uncommon species emerges in March and another in May."—G.F.W., 1918.

From the short series received which are mainly females this species as represented in Cyprus is remarkably uniform in colour, marking and size. It has the *adrasta* Dup., characteristic, increase of the fulvous areas on all wings, but is rather of a brown yellow than of an ochre yellow, and hence should be designated the race *orientalis* Stdgr. Curiously only one specimen has the apical spot bipupillate, which is a strong character of the females as a rule. This remark also holds for the underside. The hind-wings above show scarcely any brown yellow on the disc, the brown suffusion being predominant.

Epinephele telmessia Zell. (**E. jurtina** v. **telmessia** Zell.) [race **kurdistana** Rühl. (?)].

"Not common and extremely worn at Larnaka, June 25th, 1902."—T.B.-F., 1902.

"This species was common; my specimens were race *hispulla*."—J.A.S.B., 1916. [Not recorded by Led.]

"A very common species both in the plains and on the mountains from April to August. Found in small caves, on the brinks of rivers and under the shade of thick trees, preferably wattle."—G.F.W., 1918.

Until the paper published in the "Bull. Soc. ent. Fr.," p. 225 (1912) by Le Cerf, the form *telmessia* Zell., had been regarded as a *jurtina* race. However, when the genitalia of the two were examined and compared, ample evidence of their being distinct species was obtained. In *jurtina* there were found to exist two peculiar prolongations

of the lower posterior angles of the last free tergite, known as the Julien organs, which were not found in the *telmessia*. The figures given (*l.c.*) by Le Cerf show this very clearly.

E. telmessia in Cyprus is of a richer and darker coloration generally than one finds in *E. jurtina*. In marking both sexes resemble the race *hispulla* Hb., of the latter species, but are somewhat smaller.

The males have an androconial patch of a more defined shape, the tip appearing prominent in outline because the ground-colour of the discal area around it is lighter. The patch itself is brighter and more velvety than in the male of *E. jurtina*. Only in one or two examples do the males show a tendency to a submarginal band on the fore-wings. The apical spot is ocellated and occasionally has a small extension at the lower edge, which has become separate in one example as a small black dot.

The females have more resemblance to the race *hispulla*, the disc is never ochre yellow, but a rich foxy-brown instead. The wide submarginal band is always lighter than the discal area and is lighter still around the apical spot, while on the inner margin it has become quite evanescent. There is a tendency for this band to break up into blotches, as is the characteristic of the race *kurdistana* Rühl. On the hind-wings there is but little development of the band, which is only of a very dull foxy-brown sufficient to differentiate it from the prevailing dusky ground. The apical spot is bipupillate in about 50% of the specimens, the lower pupil being always the smaller and often very small. One or two examples have a slight dot in the interneural space below this.

The shading of the underside of the hind-wing below in the female is sometimes of a very pleasing arrangement of light greys with delicate shades of light orange thrown in.

Epinephele lupinus Costa (**E. lycaon** Rott., race **lupinus** Costa) [ab. **janirula** Esp.; ab. **subalbida** Schultz; ab. **intermedia** Stdgr.].

"This species was common. Miss Bate took race *lupinus* in 1901. My specimens included both forms."—J.A.S.B., 1916. [If all the above specimens are in the B.M. this is an error.—H.J.T.]

"I am inclined to think one may call all the *lycaon*, var. *lupinus*."—A.E.G., 1916.

" Flies at the same time and has the same habits as *E. jurtina*, but is not nearly so common."—G.F.W., 1918.

This is another species of *Epinephele* which up till recent years has been confused with a well-known and common allied species of Central Europe. In 1909 Count Turati, after receiving many local forms of *E. lycaon*, made a thorough investigation of their genitalia and unhesitatingly separated *lupinus* as a true species (" Nat. Sic.," p. 56, etc., pl. vii, figs. 1–9), calling it *rhamnusia* Frr., in error. Dr. Chapman has very kindly sketched the ancillary organs of the Cyprian *lupinus*, and they quite agree with those in the figures noted above.

E. lupinus is, in both sexes, considerably larger than *E. lycaon* of Central Europe, and the underside of the fore-wings is of a bright rust-red, practically uninterrupted in the male, but in the female the submarginal area is separated from the discal by a transverse dark line. The underside of the hind-wing is uniformly strongly speckled, and has very obsolescent transverse lines. The males have the androconial patches larger than in the males of *E. lycaon*, being both longer and wider and are more definitely margined and conspicuous. The general ground-colour is of a deeper brown, more on the black side than the orange side of brown coloration. In the female the bright orange colour is confined to conspicuous rings around the two (apical and marginal) spots. Occasional specimens have a slight fulvous flush on the disc of the fore-wing, but never in any degree comparable to what occurs frequently in *E. lycaon*, nor does this flush ever extend to the hind-wings, which in both sexes are practically uniform deep brown, showing now and then a faint indication of a transverse line separating the basal and marginal areas. The two black submarginal spots on the fore-wing of the female are mostly large and conspicuous, the apical being always the larger, but the mid-marginal spot is variable in size, and in one example is only represented by a black dot in a dull fulvous blotch. In nearly every example the apical eye-spot is centred by a minute white dot. In the male there is only one spot, the apical, which varies but little in size. Only in one female is there an incipient spot between the usual two on the fore-wing.

One specimen is very small, only measuring 40 mm. compared with 50 mm. the average of the *lupinus* in expanse; it may possibly be called the ab. *janirula* Esp.;

it was taken in the plains near Nicosia, and is a female. The more or less common Epinephelid aberration of irregular lighter patches of ground occurs only in one specimen in a very long series sent, a male, but hardly strong enough to be termed ab. *subalbida* Schultz. Most of the specimens, especially the females, have strongly scalloped hind-wings, and may be called the ab. *intermedia* Stdgr.

[**Coenonympha pamphilus** L.

"I did not meet with it. Led. records this species and the form *lyllus*."—J.A.S.B., 1916.

"Recorded, but I have never seen it. In 1918 I heard of one having been taken by a school-boy at Kyrenia."—G.F.W., 1918.

Major Graves says (*in lit.*): "Occurs in Lebanon, but always at over 2000 ft. in my experience." Its occurrence in Cyprus has never been confirmed.]

Charaxes jasius L.

"I found this species very sparingly. I took one specimen on a sugared tree in daytime at an altitude of over 5000 ft."—J.A.S.B., 1916.

"I have found this species very sparingly. It apparently emerges in July or August at a few localities both in the plains and on the mountains. It is very difficult to catch as it frequents the tops of large trees, usually fruit. I took one specimen on a 'sugared' tree on Troödos in July 1915 and another in July 1918."—G.F.W., 1918.

Comparing the specimen received with Sicilian examples there seems practical identity. The orange marginal coloration is perhaps somewhat lighter in shade in the Cyprian example.

Limenitis rivularis Scop.; ["**camilla** Schiff."]

"Led. records this species. I obtained it but not commonly on the mountains."—J.A.S.B., 1916.

"*L. rivularis* has the spots much stronger than those I took in the Balkans."—A.E.G., 1916.

"Confined to the Troödos range of mountains, where it occurs in June and July rather sparsely. Difficult to take as it is generally on blackberry bushes overhanging rivers."—G.F.W., 1918.

I see no variation from the ordinary European form.

Pyrameis atalanta L.

"Recorded by Led. as common, as I found it."—J.A.S.B., 1916.

"A few are to be seen the whole year round in the plains, generally in gardens. I have only twice taken it on the Troödos mountains."—G.F.W., 1918.

Quite an ordinary form.

Pyrameis cardui L.

"Fairly common at Limasol on June 25th, 1902. Large specimens, difficult to catch and fond of settling in the shade."—T.B.-F., 1916.

"Very common everywhere. Recorded by Led."—J.A.S.B., 1916.

"Very common everywhere. Fresh specimens emerge in April and July, but individuals may be seen on the wing throughout the year."—G.F.W., 1918.

Quite normal specimens received.

Eugonia polychloros L. [race **fervida** Stndfs.].

"Recorded by Led. I did not meet with it."—J.A.S.B., 1916.

"Recorded in 1875. It has not since been seen until 1918, when I saw three individuals in a small pine plantation near my hut in Troödos, but owing to the denseness of the trees I was only able to take a very ragged specimen after several days spent trying to catch them."—G.F.W., 1918.

The specimen referred to above must, I think, be called *fervida*, the Asia Minor race named by Standfuss and intermediate in size and brilliancy between the large and fiery Algerian race *erythromelas* Aust., and the smaller European type. Probably the specimens seen were immigrants from the Taurus, where the race *fervida* is well known to occur.

[**Polygonia egea** Cr.

"Recorded by Led. as *V. triangulum* Fb. I did not meet with it."—J.A.S.B., 1916.

No specimen received.]

[**Melitaea phoebe** Knoch.

"Recorded by Led. I did not meet with it."—J.A.S.B., 1916.

None sent.]

Dryas pandora Schiff.

"I found this beautiful fritillary in some numbers high up on the southern range. It is very fond of visiting the flowers of a low ground-thistle."—J.A.S.B., 1916.

"All I have to say about this is that it is small and rather lightly marked. I daresay you have discovered that the best way to take this insect is when it is feeding on a thistle. It is a strong flier and difficult to catch on the wing."—A.E.G., 1916.

"Confined to the Troödos range of mountains at high altitudes. Flies in June, July and August, and is fairly common. Very fond of visiting the flower of a low ground-thistle."—G.F.W., 1918.

Quite small, and typical in marking and colour.

Libythea celtis Laich.

"Recorded by Led. I found it, though not abundantly, on the southern mountains."—J.A.S.B., 1916.

"Confined to the Troödos range of mountains. Rare. I have only taken it four times in ten years, during July and August."—G.F.W., 1918.

Klugia (Thecla) spini Schiff.

"Reported to me by Major P. P. Graves as having been taken in Cyprus."—J.A.S.B., 1916.

Bithys quercûs L.

"I obtained this species on the Southern range."—J.A.S.B., 1916.

"Confined to the Troödos range of mountains at high altitudes; it is not uncommon. Flies in June and July and is usually found on the dwarf oak (*Quercus alnifolia*)."—G.F.W., 1918.

The few examples received are quite typical.

Cigaritis acamas Klug. = [**Cigaritis zohra** Donz.].

"I obtained a few specimens from the Northern hills."—J.A.S.B., 1916.

"I have only taken this species once, on the Kyrenian mountains in July."—G.F.W., 1918.

Major Graves writes me: "I believe that Marsden showed me *Cigaritis* not *zohra* but *acamas* from Cyprus."

I have just received a *Cigaritis* taken on Troödos, Aug.

3rd, 1919, which is undoubtedly *C. acamas*. Lederer reports *C. acamas* as taken by Zach at Beirut commonly.

Loweia (Thersamonea) (Chrysophanus) thersamon Esp. [aest. g. **omphale** Klug.].

"I found this species common in the plains."—J.A.S.B., 1916.

"Specimens of both broods were sent. The later brood has short * tails to the hind-wings."—A.E.G., 1916.

"This species is fairly common in the plains. Three broods emerge each year; a small one in March, a large one in May or June and then a small brood in September. In 1918 I saw none in March and only one had emerged by June 12th, the date I left the plains."—G.F.W., 1918.

Until this year only odd specimens came. The spring brood specimens have no tails to the hind-wings, whereas members of the summer brood, known as *omphale* Klug., possess fairly long tails. There seems very little variation in the markings. An examination of about twenty, which have recently been received, leads one to the opinion that the tails in the females are more developed, longer and larger, than in the males. I note that specimens taken in October are tailed, and hence may be considered as the "laggard" portion of the summer brood rather than the "precocious" portion of the spring brood. Of course they may be an actual third brood, since the period between the summer and late autumn appearances is a comparatively long one.

Rumicia phlaeas L. [race **eleus** Fab.; ab. (race) **turcicus** Gerh.; **caeruleopunctata** Stdgr.].

"Recorded by Led. I found it and the form *eleus* common."—J.A.S.B., 1916.

"This insect has two broods, a small one in March and a large one in May–August. Found on both ranges of mountains and on the plains. Fond of dry stony ground."—G.F.W., 1918.

"Var. *eleus* is much more common than *phlaeas* itself."—G.F.W., 1918.

Of the spring brood only a few have been received, taken in April and of quite ordinary form. A female, dated April 28th, is of large size and has the veins on the disc

* A *lapsus calami*.—H.J.T.

of the fore-wing well outlined with dark scales, while the hind-wing has a few small blue spots on the inside of the orange margin. One would call the slight projections on the hind margin "teeth" rather than "tails" in these early specimens. The rest of the series, captured subsequently up to August, are referable to a form of the southern race *eleus*, Fab., that is they have a dark suffusion, more or less of the depth of the other black markings, running from the base of the fore-wing over the whole of the discal area below the discoidal cell, internal to the marginal row of spots, and only touching the black hind-marginal band below and beyond the bipartite spot of the inner angle. This suffusion is usually a rich brown of varying depth rather than black. This particular form of the *eleus* race is the ab. *turcicus* of Gerhard. In fact, Tutt's description in "Brit. Lep.," viii. p. 377, of Gerhard's figure might have been taken from a Cyprian specimen. One phase of this suffusion is the development of a brown black ring around each of the black spots of the fore-wing. In all these later specimens the tails to the hind-wings are well developed as a rule, and even the anal angle is emphasised into a very prominent tooth almost to be called a tail in some cases. There is much variation in size, the smallest specimen, a male, date Aug. 5th, Troödos, measures only 22·5 mm. in expanse, while a female taken there the day before measures 33·5 mm. There is but little variation in depth of the orange coloration. In some examples the dark marginal area is expanded inwards reaching closer to the row of black spots on the fore-wing; one or two females are well emphasised ab. *caerulcopunctata*, Stdgr., that is they have a row of blue spots on the hind-wing. The undersides seem very uniform in both colour and marking.

Lampides boeticus L.

"Recorded by Led. Taken by Miss Bate in 1901. I found it extremely abundant, indeed in myriads in the cultivated leguminous crops."—J.A.S.B., 1916.

"A very common species from April to October, both on the mountains and in the plains in cultivated leguminous crops. It has three broods, in March, May and September, the first and last being small broods. This species varies greatly in size."—G.F.W., 1918.

The variations of the series sent are only slight extensions

or suppressions of the coloration and marking shown in the typical form. The blue area of the fore-wings in the female is somewhat more extended marginally. Most species which are attached to plants extensively cultivated vary greatly in size, and this species is no exception.

Syntarucus (Langia) telicanus Lang [race **aegyptiacus** B.-B.].

"Recorded by Led. In the Brit. Mus. Collection are Cyprus specimens from Lederer's collection of the form *aegyptiacus*. I obtained it fairly commonly in the northern hills."—J.A.S.B., 1916.

"Var. *aegyptiacus*. A not uncommon species in the plains during July and August. I have taken very few examples as I am usually away from the plains during these months."—G.F.W., 1918.

Only a few specimens have been received.

Tarucus balcanicus Frr. [not **theophrastus** F.].

"Recorded by Led. The species was obtained by Glazner in 1896 (*teste* B.M.). I obtained the form in the southern hills."—J.A.S.B., 1916.

"A fairly common species during May–July in the plains. Usually found on dry stony ground and on brambles."—G.F.W., 1918.

T. balcanicus is treated in Seitz, "Pal. Gr.-Schm.," as a form of *T. theophrastus*, hence possibly the apparent confusion. That these are two quite distinct species has been conclusively proved by Mr. G. T. Bethune-Baker in his "Revision of the genus *Tarucus*" (Trans. Ent. Soc., Lond., 1918), by the examination of the genitalia and of the androconial scales. Dr. Chapman has very kindly verified these Cyprians as *balcanicus* and not the new species which was (*l.c.*) described under the name *mediterraneae*, B.-B. The long series received show scarcely any aberration.

Chilades phiala Gr.-Gr. = [**Zizera galba** Led.].

"Recorded in the Annals of the Cyprus Natural History Society (1912–13) as having been taken for the first time in 1912 or 1913."—J.A.S.B., 1916.

"Fairly common in the plains."—G.F.W., 1918.

A long series very uniform in size and appearance. I am indebted to the kindness of Dr. Chapman for the identification of this species by morphological examination.

Major Graves writes: "So far all '*galba*' I have seen from the Near East except those in Miss Fountaine's collection are *karsandra*."

[**Zizeeria lysimon** Hb.

"Recorded, but I have never seen it."—G.F.W., 1918. Recorded by Led.

One would be inclined to suggest this as a wrong identification for the last species, had not Lederer given a description. "Brown male, blue at base; fringes brown, underside pale grey with discoidal lunules and basal eyes; a double row of black marginal spots and angulated central row of black dots, $\frac{2}{3}$ inch." There has been no subsequent record.

Major Graves says (*in lit.*): "I am very doubtful as to whether *lysimon* occurs in the East, North of the Red Sea."]

Chilades trochylus Frr.

"Recorded by Led. Taken by Miss Bate in 1901. I found it on both mountain ranges."—J.A.S.B., 1916.

"Fairly common in the plains May–August and also occurs rather rarely on both ranges of mountains. Fond of dry stony ground."—G.F.W., 1918.

A long series also very uniform in appearance. One or two of the males are much smaller than the others.

Scolitantides baton Bergstr.

"*S. baton*, a rather large form."—A.E.G., 1916.

"A rather rare species first taken by myself in the plains in April 1914, since when I have each year taken two or three examples."—G.F.W., 1918.

In April 1919 this species seems to have been more common as about two dozen were sent me, most of them comparatively large in size. One or two of the males have a narrow dark margin to all the wings, otherwise they seem very uniform and typical in coloration.

Aricia medon Hufn. (**astrarche** Bergstr.) [form **ornata** Stdgr.; ab. **calida** Bell.; **brunnescens** Harr.].

"Recorded by Led. I found it very common."—J.A.S.B., 1916.

"Of var. *ornata*, the spring form, I have only one ♀, but it is very nice, the underside being silvery white and

the spots showing up well. The males received are not quite so distinctive. The majority are the summer form *calida*, but not so distinctly *calida* as those I took in Corsica and Algeria. The first *calida* is from Nicosia, May 30th. In this brood the underside is coffee brown."—A.E.G., 1916.

"This insect has two broods; one in March in small numbers, and one in June, the latter being very abundant both in the plains and on the mountains; usually found near water."—G.F.W., 1918.

No specimens of the spring brood have come, but a large number of the June–July emergence from Troödos. There are but few quite dark enough on the underside to be termed the ab. *calida* Bell., and some are fairly light. In all examples the submarginal band of red blotches on the upperside are strongly developed and of brilliant colour; in many specimens these blotches are continued of full size right up to the costa at the apex, and even when diminished in size only rarely is the topmost blotch absent. On the undersides the red blotches are also very vivid, they are large and pretty uniform in size. The inner side of each blotch on the fore-wing below is in most specimens margined by a black cloud, which is generally large on the blotches nearer the inner margin of the wing, but diminishing to a line or is even absent on the blotches towards the costa. In the reverse way these black clouds are margined on the inner side by white lines which are always present towards the costa, but diminish in strength towards the inner margin of the wing. All the spots on the undersides are of intense black and well developed. They are surrounded by very clear white rings especially marked in the discal spots of the fore-wings. The specimens are all of good size, in fact rather large compared with British examples, a few as large as average *Polyommatus icarus* females. In most specimens the fringes of the fore-wings were brown, dark enough to obliterate the chequer. I believe these last have been called ab. *brunnescens* Harr.

Polyommatus icarus Rott. [ab. **minor** Ckrll.].

"Common. The variation among males is very small. The females have an external series of outer-marginal spots (light in colour) outside the orange spots. One specimen was ab. *icarinus*."—T.B.-F., Larnaka, 25th June, 1902.

"The *icarus* males appear to present no special features."—A.E.G., 1915.

"Recorded by Led. I found it abundant."—J.A.S.B., 1916.

"The male *icarus* are a fairly even lot. The spring brood has light underside sometimes without blue scaling. Two were only 21 mm. in expanse, too large by 1 mm. to be called ab. *minor*. The blue-tinted females of the early brood are interesting. Some have bluish-white lunules on the basal sides of the orange spots and are very beautiful. The best come from S. Hilarion in April. The summer-brood females have no blue scales. Ab. *celina* of the male with black spots between the veins at margin on hind-wing was not sent. This is generally found in late broods in the South. In one male the antemarginal band of spots on the hind-wing underside is missing."—A.E.G., 1916.

"A very common insect everywhere having three broods, in March, May and September. Females with blue only occur in the first brood."—G.F.W., 1918.

The series were taken in March, April, May, June and July, an odd female in September and a male in October. There are only a few females and these are in the May, June and July series. The males are remarkably uniform, even the undersides show only the smallest variation in general coloration and marking. The few females are practically identical, there is only the merest trace of blue powdering towards the base of the wings upperside. One female is ab. *minor* Ckrll., just 20 mm. in expanse, and another had the usually orange spots on both upper and under side changed to yellow. There was a tendency in the race to the ab. *icarinus* Scriba, form, in that the spots basad from the discoidal on the fore-wing underside were frequently ill-developed, very small, and in a few specimens the lower spot was absent. It was usually smaller than the upper one.

[**Glaucopsyche cyllarus** Rott.

"Recorded by Led. I did not meet with it."—J.A.S.B., 1916.

"Recorded, but I have never seen them."—G.F.W., 1918.]

Glaucopsyche paphos, n. sp. (Chap.) [**Glaucopsyche melanops,** Bdv.].

"I obtained this species on the Northern mountains in spring."—J.A.S.B., 1916.

"Occurs on both ranges of mountains in small numbers. On the Kyrenian range it flies during April and May, and on the Troödos range during June and July."—G.F.W., 1918.

Not being satisfied with the received determination of the Cyprian series as *G. melanops* Bdv., I submitted them to Dr. Chapman, who after some comparisons thought that they were probably a form or race of *G. charybdis* Stdgr. On further examination, however, he considered that he was justified in announcing it a new species standing somewhat close to *G. charybdis*.

Only a few specimens were obtained, and these were from the two ranges of mountains. One would like to get the other brood from each place if there be one. The two sets differ considerably in size; those from the Kyrenian mountains are much the smaller in both sexes. These northern early specimens being the smaller would seem to point to their being of an early brood, the offspring of summer larvae, added to the fact that the later specimens from Troödos are large and probably the imagines from well-nourished spring larvae. The undersides of both series are very dark and the spots on the fore-wings below very large. One female from Troödos has a series of blue dashes on the outer margin of the hind-wings.

Major P. P. Graves writes me: "The only Cyprian *melanops* I have seen struck me as being somewhat different from French *melanops*." He goes on to doubt the occurrence of *melanops* in Cyprus when it does not occur in "S. Italy(?), Greece, Asia Minor, Turkey, etc.," and suggests the examination and comparison of its genitalia.

G. paphos has the general appearance of a *Glaucopsyche*, and at the first glance, without comparison, might readily be taken for a dark form of *G. melanops*. When, however, series of the two species are placed side by side one immediately separates them, both the males and the females, as being quite distinct. The blue of the males of *G. paphos* is deeper, more dense and richer, and although the veining may be apparent it is by no means distinct as in *G. melanops*, nor is there any suggestion of the silvery sheen of the latter. The margins are deep black somewhat wider than in *G. melanops*. The ground-colour of the female is a uniform deep black brown very distinct from that of the *G. melanops* female, and quite without any blue suffusion from the base, but with a few traces of blue spots on the hind margin of the

hind-wings of one example. On the underside the ground-colour of *G. paphos* is dark with much less grey in it than in the other species and without any blue suffusion at the base. The curved row of spots on the fore-wing assimilates generally to that of *G. melanops*, but the fourth spot from the costa is in alignment with the second and third and not as in *G. melanops* "round the corner" in alignment with the third and fifth. On the margins of the hind-wings of *G. paphos* there are no traces of the semi-suppressed row of eye-spots which are invariably found in *G. melanops*.

Celastrina argiolus L. [ab. **hypoleuca,** ♀, Koll.].

"I found this species abundant high up on the southern range."—J.A.S.B., 1916.

"*C. argiolus* is a distinct form with very white almost unspotted undersides in summer brood. No spring brood specimens were sent."—A.E.G., 1916.

"Confined to the Troödos range of mountains, where it is common during June and July. Usually found near water on the dwarf oak and among bracken. Mr. Gibbs thought this species might be separated into a Cyprian variety on account of its very pale and almost spotless underside."—G.F.W., 1918.

Only specimens of the later brood have been received. The females are particularly dark, a small area only of the fore-wing and scarcely any of the hind-wing has blue coloration; in fact, in a long series one might reasonably expect to find an uniformly dark female, so much has the blue become obsolescent. The underside, as noted by Mr. Gibbs, is light in colour and the markings are much diminished in emphasis, but in some specimens I note that the most obvious underside markings are the dark submarginal **V** marks beginning at the inner angle and diminishing in size upwards on the fore-wings. The dark female is, I believe, the form known as ab. *hypoleuca* Koll.

Major P. P. Graves tells me that this dark form of female occurs in Syria.

Carcharodus alceae Esp.

"Recorded by Led. I found it abundant in the plains."—J.A.S.B., 1916.

"Fairly common everywhere, March–October."—G.F.W., 1918.

A fairly long series with very little variation was received.

The smallest male measures 23 mm. in expanse and the largest 32 mm.

[**Carcharodus (Spilothyrus) boeticus** Ramb. (**marrubii** Ramb.).

" Recorded by Led. I did not recognise it."—J.A.S.B., 1916.

This was recorded by Led. as *Hesperia marrubii*. None have been sent me, so I am unable to substantiate the record.

Major P. P. Graves writes me: " I take it that by *marrubii* was meant one of the *altheae* group, *boeticus* or perhaps *E. orientalis* Rev. I have *E. boeticus* from Beirut and *E. orientalis* from Lebanon localities."]

Hesperia (Powellia) orbifer Hb.

" Led. records this. I did not find it."—J.A.S.B., 1916.

There seems to be no subsequent record of this species in spite of considerable collecting over ground on which it should appear if present.

Lederer reports this species as *Hesperia eucrate* Esp., and var. *orbifer* Hb. His collector, Zach, also took the two at Beirut (July 1853–Aug. 1854).

Major P. P. Graves says: " This species is so widespread in Asia Minor and the North and Centre of the Syro-Palestinian area, only ceasing in the low ground of part of S. Palestine, that I am strongly inclined to follow Lederer and put it down to the credit of Cyprus. I think that the earlier collectors in the Near East frequently confused *P. sao* Hb., or forms thereof, with *P. orbifer*. *P. sao* seems to reach W. Macedonia (*vide* Barraud's lists), but I have not yet seen any clear evidence of its occurring in the S.E. Balkans, let alone Asia Minor. I think that the large rather brightly marked form of *P. orbifer*, which occurs in spring at Beirut, etc., may be intended by Lederer for *P. orbifer*, and that by *H. eucrate* may be intended the small less distinctive-looking later brood specimens."

[**Hesperia (Powellia) sao** Hb. [race **eucrate** Och.].

" Led. records this. I did not find it."—J.A.S.B., 1916.

See the above remarks under *P. orbifer*.]

[**Hesperia alveus** Hb.

" Led. records it. I did not obtain it."—J.A.S.B., 1916.

This record also seems never to have been confirmed.

Major P. P. Graves writes me: "As far as I can understand from Reverdin's and Oberthür's work on the subject *H. alveus* proper does not seem to have been recorded except in France, Spain, Switzerland, Italy, and ? Germany, etc., in fairly high altitudes, and its place on the low ground is taken throughout most of Europe by *H. armoricanus* Obthr. I have taken the latter once in the Lebanon, where it is a high-ground insect, and frequently at Constantinople, where it occurs at the sea-level. I have seen specimens from Brussa, and took one at Smyrna, Oct. 18th, 1913. The statements made by Staudinger *re* the occurrence of *H. alveus* in Asia Minor ("Lepidopteren Fauna Kleinasiens") are worthless because he did not recognise the difference between the many forms of the *alveus* group (*onopordi*, *fritillum*, etc.). He did not submit his captures to any microscopic examination of the male genitalia."]

[**Hesperia malvae** L.

Led. records this species. I did not recognise it.—J.A.S.B., 1916.

Again an unconfirmed record.

Referring to the worthlessness of the Staudinger records of this group, Major P. P. Graves writes (*in lit.*): "Consequently one can say little as to what occurs in the interior of Asia Minor in the way of 'spotted skippers,'" and of *malvae* he says, "Constantinople region, not common."]

Thymelicus (Adopaea) acteon Rott. [race **obsoleta** Tutt; **clara** Tutt].

"Led. recorded this species. I found it common."—J.A.S.B., 1916.

"Fairly common in the plains in May."—G.F.W., 1918.

A long series were received, all very uniform and somewhat larger and lighter in colour than the average Central-European form, especially the males. There is an absence of the usually distinct pale markings noted in the British and Central-European races, and hence the form may be called *obsoleta* Tutt, combined with form *clara* Tutt, that with more golden brown ground-form *clara-obsoleta*.

Major P. P. Graves says (*in lit.*): "Syrian *acteon* are larger and much less markedly suffused than those from Greece (Athens), Asia Minor, etc., in my collection."

Adopaea flava Brunn. (**thaumas** Hufn.) (**linea** Fab.).

"Major P. P. Graves informs me that this species has been taken in Cyprus by Mr. Marsden. I did not recognise it."—J.A.S.B., 1916.

Major P. P. Graves writes me: "I *saw* a bad specimen of this or *A. lineola* in a small collection formed by Mr. T. H. Marsden of Alexandria in the Troödos range."

Mr. Wilson has not met with this species.

Gegenes nostrodamus Fab.

"Recorded by Led. Taken by Miss Bate in 1901. I did not recognise it."—J.A.S.B., 1916.

"Rather rare in the plains in June and July."—G.F.W., 1918.

Two or three specimens received are quite typical and indistinguishable from a specimen I have from Central Italy.

Parnara mathias Fb.

"I found this species common."—J.A.S.B., 1916.

"Rare in the plains in June and July."—G.F.W., 1918.

Four specimens only have been received. Evidently it is very local.

[**Parnara zelleri** Led.

"Major P. P. Graves informs me that this species has been taken in Cyprus. I did not find it."—J.A.S.B., 1916.

There is no confirmation of this record. Major Graves says (*in lit.*): "I once took this species at Beirut."]

In conclusion, I wish to express my thanks to the Rev. G. Wheeler for looking through the manuscript, and also for help with the proof.

IX. *The Geographical Factor in Mimicry.* By F. A. Dixey, M.A., M.D., F.R.S., Subwarden of Wadham College, Oxford.

[Read March 17th, 1920.]

Plate VI.

In endeavouring to interpret the remarkable phenomena that are grouped under the head of Mimicry, it is important to take into account the fact that the forms resembling each other are as a general rule to be found inhabiting the same regions. This feature in the case has often received comment, and many illustrations have been adduced of the close connection between similarity of aspect and geographical proximity. The mimetic combinations of Heliconinae, Danainae, Ithomiinae and other subfamilies, modified concurrently according to their respective habitats in various parts of the South American continent and the adjacent island of Trinidad, are well known.* Other instances are certain "homoeochromatic" assemblages in the Oriental region, each comprising representatives of the Danaine, Pierine, Papilionine and occasionally the Satyrine subfamilies. These are only a few of the cases that have come to light, in which a geographical modification of a dominant form or forms has been reflected in a corresponding alteration in the aspect of the associated mimics.

The bearing of the facts here referred to on the question of the origin of mimicry is obviously of great significance; and it may be not superfluous to add a few more instances of the kind which have not hitherto met with detailed treatment or illustration. One such case is that of the parallelism between the genus *Prioneris* and certain species of the genus *Delias*, both of these genera being Pierines, though not closely related in affinity. So long ago as the year 1867 this parallelism was noted by Mr. Wallace, and subsequent investigation has tended not only to confirm, but also to extend his conclusions. Some of the mimetic pairs are figured on Plate VI; figs. 12, 14, and 16 showing the species of *Delias*, and figs. 13, 15 and 17 the

* See Poulton, "Essays on Evolution," 1908, pp. 272, 273.

forms of *Prioneris* that so closely resemble them. *D. eucharis* Drury (fig. 12), as is well known, is widely distributed in the Indian region. In Southern India and Ceylon it is joined by *P. sita* Feld. (fig. 13), which according to Fruhstorfer, flies in company with the *Delias*, and rests just like the latter with closed wings on the flowers of the Lantana. *D. belladonna* Fabr. (fig. 14) and *P. thestylis* Doubl. (fig. 15) form another geographical mimetic pair from the mountainous districts of northern India. In Borneo we have *D. indistincta* Fruhst. (fig. 16) and its very exact copy *P. cornelia* Vollenh. (fig. 17). Other mimetic pairs not here figured are *D. egialea* Cram. with *P. hypsipyle* Weym. of Sumatra, and *D. crithoe* Boisd. with *P. autothisbe* Hübn. of Java. The two latter species are said by Fruhstorfer to visit the flowers of cinchona in each other's company.

A remarkably interesting mimetic series is shown in figs. 4 to 11 of Plate VI. Fig. 5 represents the underside of *H. laeta* Hew. of Timor, a butterfly whose aspect differs so greatly from that of its congeners as to have suggested to Mr. Wallace the possible existence of a model belonging to the *belisama* group of *Delias*. Thirty-four years after the date of Wallace's paper, the missing model turned up in the person of a fine *Delias* discovered in Timor by Mr. Doherty, and named *D. splendida* by Lord Rothschild (fig. 4). Though the resemblance between the *Delias* and the *Huphina* is deceptively close, there is yet a difference to be observed in the fact that *H. laeta* possesses a row of marginal scarlet spots on the hind-wing which are not to be found in *D. splendida*. But before leaving Timor Mr. Doherty completed the assemblage by finding another *Delias*, named *D. dohertyi*, after its discoverer, by Lord Rothschild (fig. 6). In this butterfly the resemblance to the two former species is close; and it possesses, which *D. splendida* does not, a row of scarlet spots running parallel with the outer border of the hind-wing. On the other hand, the scarlet costal streak, conspicuous in *D. splendida* and *H. laeta*, is absent from *D. dohertyi*. The *Huphina* therefore may be said to combine in itself two characteristic features which are found separately in the two *Delias* models.

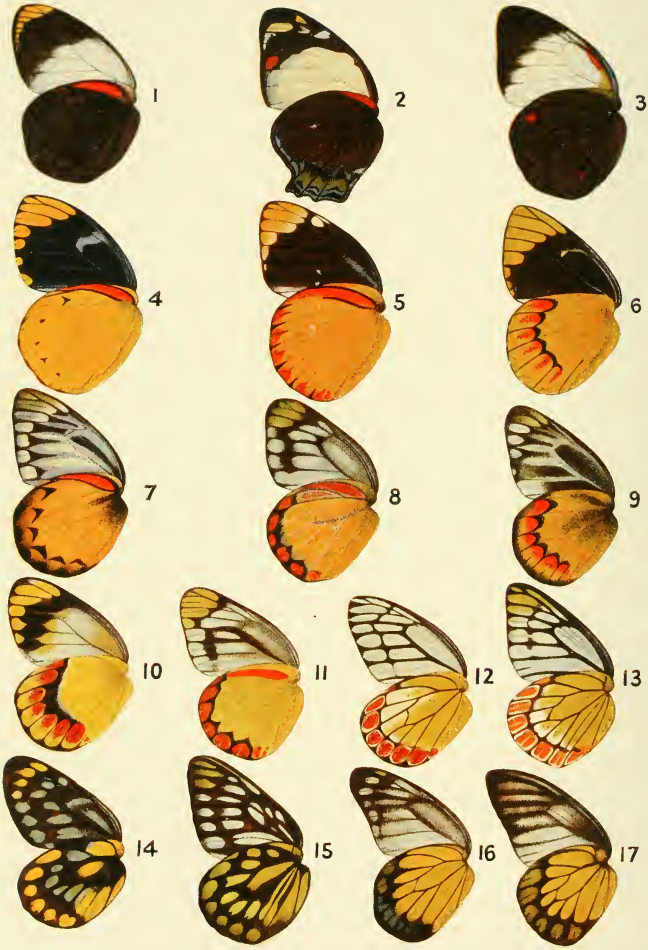
We may now turn to the islands of Lombok, Sumbawa and Flores, where we find geographical representatives of all three members of the Timor assemblage. It is inter-

esting to observe that just as the members of the South American mimetic associations undergo a simultaneous change corresponding to a different locality, so does the *Delias–Huphina* combination in all three of its members alike.

The *Huphina* in the islands of Lombok, Sumbawa and Flores which represents *H. laeta* of Timor is *H. temena* Hew. (fig. 8). The *Delias* corresponding to *D. splendida* is *D. oraia* (fig. 7), and the *Delias* answering to *D. dohertyi* is *D. sumbawana* (fig. 9). In all three of the Lombok, Sumbawa and Flores assemblage, the uniformly black fore-wing of the Timor butterflies is replaced by a pale ground-colour streaked with black (the black streaks being nervular in the *Huphina* and internervular in the two *Delias*); the scarlet costal streak is also less definitely black-bordered in *H. temena* and *D. oraia* than in *H. laeta* and *D. splendida*; while the marginal scarlet spots have a more strongly-marked dark bordering in *H. temena* and *D. sumbawana* than in *H. laeta* and *D. dohertyi*, their counterparts in Timor.

Finally, in the island of Sumba occurs another representative of *H. laeta*; viz., *H. julia* Dohert. (fig. 11), another of Doherty's discoveries. Along with it is found a *Delias*, *D. fasciata* Roths. (fig. 10), which bears the same relation to *H. julia* as *D. sumbawana* to *H. temena*. A *Delias* corresponding to *D. splendida* and *D. oraia* has, so far as I am aware, not yet turned up in Sumba, but it may be not too rash to anticipate that a model may some day be found to account for the scarlet costal streak in *H. julia*, which is absent from its associated *Delias*.

Attention may likewise be drawn to the three New Guinea butterflies whose undersides are represented in Plate VI, figs. 1, 2 and 3. Here again we have an association between a *Delias* (*D. ornytion* Godm. and Salv., fig. 1) and a *Huphina* (*H. abnormis* Wallce., fig. 3). In this case the company is joined by a Nymphaline, *Mynes doryca* Butl. (fig. 2). As I have dealt somewhat fully with these butterflies in a recent paper (Trans. Ent. Soc. Lond., 1918, pp. 118–129), I need say no more about them on the present occasion, except to notice the fact, previously alluded to, that in the ordinary position of rest, with the fore-wings depressed, the scarlet streak on the hind-wing of the *Mynes* will be found to correspond more or less exactly with the similarly coloured streak on the fore-wing of the *Huphina*, and the scarlet



MIMICRY IN EASTERN BUTTERFLIES.

EXPLANATION OF PLATE VI.

Fig.			
1.	Delias ornytion	*Godm. & Salv.*	New Guinea
2.	Mynes doryca	*Butl.*	,,
3.	Huphina abnormis	*Wallce.*	,,
4.	Delias splendida	*Roths.*	Timor
5.	Huphina laeta	*Hew.*	,,
6.	Delias dohertyi	*Roths.*	,,
7.	Delias oraia	*Dohrt.*	Lombok, Sumbawa, Flores
8.	Huphina temena	*Hew.*	,,
9.	Delias sumbawana	*Roths.*	,,
10.	Delias fasciata	*Roths.*	Sumba
11.	Huphina julia	*Dohrt.*	,,
12.	Delias eucharis	*Drury*	India, Ceylon
13.	Prioneris sita	*Feld.*	S. India, Ceylon
14.	Delias belladonna	*Fabr.*	N. India
15.	Prioneris thestylis	*Doubl.*	,,
16.	Delias indistincta	*Fruhst.*	Borneo
17.	Prioneris cornelia	*Vollenh.*	,,

patch on the hind-wing of the *Huphina* with a similar patch on the fore-wing of the *Mynes*. This, like the position, with regard to the veins, of the streaks on the fore-wing of the Lombok butterflies, provides a further illustration of a principle frequently to be observed in mimicry; viz. that the mimetic assimilation aims only at the general effect of the resemblance, and is apt to ignore considerations of mere homology.

As to the cause and mode of origin of these startling likenesses, every one must interpret the facts as he sees fit. It is doubtless the case that more data are wanted before the question can reach a final settlement. I would only plead that in all attempts at a solution, account must be taken of the geographical factors. And it does not seem to me possible to bring instances like the present under such headings as that of the common colouring shared by the inhabitants of desert areas or of the arctic snow-fields. Nor is it easy to imagine any external conditions of soil or climate which could directly bring about a common scheme of colouring like that of the three New Guinea butterflies, or of the pairs and triads from India and the Malay islands respectively which are shown on Plate VI. For my own part I confess that I am still of opinion that adaptation is at the bottom of the matter; and in spite of much adverse criticism I find it hard to resist the conviction that in the theory of warning colours shared between comparatively distasteful, or deceptively adopted by comparatively palatable forms, we have by far the most probable explanation as yet advanced.

Explanation of Plate VI.

[*See Explanation facing the* Plate.]

X. *New species of* Staphylinidae *from Singapore.* Part III.

By Malcolm Cameron, M.B., R.N., F.E.S.

[Continued from Trans. Ent. Soc. Lond. 1918 (1919), p. 246.]

[Read November 19th, 1919.]

The groups Oligotini, Bolitocharini, Myrmedoniini and Aleocharini are dealt with in this part of the paper together with additions to the Lispini, Pinophilini, Paederini, Staphylinini and Tachyporini.

Oligotini.

64. **Oligota forticornis,** n. sp.

Minute, convex, attenuated posteriorly, entirely testaceous, shining, exceedingly finely punctured, and covered with fine yellowish pubescence. Antennae very short and stout with 4-jointed club, entirely testaceous. Legs testaceous. Length ·75 mm.

Head exceedingly finely, scarcely perceptibly and moderately closely punctured. Antennae with the 2nd joint a little longer than broad, the 3rd to the 6th minute, quadrate, differing but little from one another, the 7th distinctly transverse and larger than the 6th, the 8th and 9th much more strongly transverse, three times as broad as long, the 10th large, oval, nearly equal in length to the three preceding together. Thorax widest at the base, twice as broad as long, the sides evenly rounded and contracted to the anterior angles; puncturation and pubescence similar to that of the head. Elytra transverse, as broad as, and a little longer than, the thorax (measured along the suture), the sides parallel; puncturation and pubescence exceedingly fine, rather closer than on the thorax. Abdomen gradually narrowed posteriorly, uniformly and exceedingly finely punctured, much the same as the elytra; pubescence yellow, a little coarser than that of the fore-parts.

Hab. District unknown. Found under bark.

65. **Oligota moultoni,** n. sp.

Minute, gradually attenuate posteriorly, black, elytra pitchy-brown, apex of abdomen rufescent. Antennae and legs testaceous, the former a little infuscate towards the apex. Length scarcely ·75 mm.

In build and coloration very similar to *O. pusillima* Grav., of Europe; it is, however, a little smaller, the antennae and elytra are shorter, the latter a little more finely punctured, and the abdomen more narrowed behind. Head exceedingly finely and not very closely punctured and pubescent. Antennae with the 1st and 2nd joints stout, of equal length, the 3rd a trifle longer than broad, the 4th square, the 5th a little broader, the 6th to the 9th distinctly transverse, gradually increasing in breadth, the last two of them quite three times as broad as long, the 10th short, oval. Thorax at the base almost twice as broad as long, the sides narrowed and rounded anteriorly; exceedingly finely and rather closely punctured and pubescent. Elytra at the base as broad as, and a little longer (measured along the suture) than, the thorax, very slightly widened behind, transverse, exceedingly finely but more distinctly punctured than the thorax, finely pubescent. Abdomen very gradually narrowed behind, exceedingly finely and moderately closely punctured and pubescent throughout.

Hab. Bukit Panjang.

Bolitocharini.

Pseudoligota, n. gen.

Labrum transverse, the anterior margin slightly emarginate in the middle, the anterior angles rounded. Mandibles rather stout, the apices pointed and incurved, the right with a small tooth at the middle of the inner margin. Maxillary palpi 4-jointed, the 1st joint small, the 2nd moderate, lightly curved and widened towards apex, the 3rd much longer and larger than the 2nd, regularly dilated from the base to the apex, the 4th subulate about half the length of the 3rd. Inner lobe of the maxilla moderately broad, parallel, the apex truncate and very finely and shortly pectinate; the outer lobe broader, the apex pectinate, the teeth longer than those of the inner lobe. The tongue very small, triangular, split at the apex. Paraglossae finely ciliate. Labial palpi 2-jointed, the 1st joint elongate, cylindrical, the 2nd shorter and much narrower than the 1st. Temples not bordered below. Prosternum short, rounded behind in the middle. Prothoracic epimera wanting.

Mesosternum moderately broad, fused with the metasternum without visible suture. Intermediate coxae moderately distant. Elytra not sinuate internal to the postero-external angle. Tarsal formula 4, 4, 5. The first pair with the first three joints short, subequal, the 4th joint longer than their combined length; the

second pair with the first three joints rather short, subequal, the 4th longer than the three preceding together; the third pair with the first two joints moderately long, equal, the 3rd and 4th gradually decreasing in length, the 5th rather longer than the two preceding together. Tibiæ finely ciliate. The structure of the antennæ and the maxillæ is similar to that of *Gyrophæna*; the 3rd joint of the maxillary palpi is more enlarged, however, than in that genus. Whilst the build of the thorax, which is widest behind with the sides gently rounded and converging anteriorly, approaches *Brachida*. At first view the species on which the genus is founded might well be taken for an *Oligota*.

66. Pseudoligota varians, n. sp.

Black, moderately shining, minute, the abdomen obscure pitchy-brown; first four joints of the antennæ, palpi and legs testaceous. Length 1 mm.

Head transverse, eyes large but not prominent, the temples small, passing insensibly into the base; sculpture consisting of exceedingly fine, scarcely perceptible and very sparing punctures. Antennæ moderate, the first four joints pale testaceous, the rest infuscate, the 1st and 2nd joints moderately stout, equal in length and thickness, the 3rd much shorter and smaller than the 2nd, the 4th transverse, broader than the 3rd, the 5th to 10th much more strongly transverse, gradually increasing in breadth, the penultimate about one and a half times as broad as long, the 11th stout, oval-oblong, fully as long as the two preceding together. Thorax strongly transverse, twice as broad as long, convex, widest behind, the sides gently rounded and converging anteriorly, posterior angles obtuse, the base slightly bisinuate; very finely and moderately closely punctured and pubescent. Elytra transverse, as long as, and a little broader than, the thorax, very finely, moderately closely and somewhat asperately punctured, finely pubescent, in the ♂ with four or five minute tubercles along the sutural margin posteriorly on either side. The abdomen pointed, obscure pitchy-brown with the seventh segment darker, very finely and moderately closely punctured and pubescent on the first four visible segments, much more sparingly on the seventh and eighth; the sides and apex furnished with black setæ. Examples are found varying in colour through every gradation of testaceous and fusco-testaceous; they are possibly immature.

♂. The sutural margin of the elytra posteriorly with four or five minute tubercles on either side. Seventh abdominal segment with a fine, short keel in the middle line before the posterior margin;

eighth abdominal segment produced in the middle into a short blunt spine, the sides and apex of which are furnished with short stiff yellowish setae.

Hab. In fungus; generally distributed.

67. **Pseudoligota robustus**, n. sp.

Minute, convex, robust, black, shining; first four joints of the antennae and palpi pitchy-testaceous; legs testaceous. Length 1·1 mm.

Very similar to the preceding, but broader, more convex and robust, deeper black in colour, with darker antennae (which are also rather stouter) and mouth-parts.

♂. Sutural margin of the elytra behind the middle with a small tubercle on either side and sometimes with traces of two others in front. Seventh abdominal segment with a short keel in the middle line before the posterior margin; eighth abdominal segment produced into a short blunt spine, which is not furnished with setae.

Hab. In fungus. Woodlands, Mandai.

68. **Gyrophaena** (s. str.) **tridentata**, n. sp.

Black, shining, thorax sometimes and base of the abdomen more or less pitchy, the former biserially punctured; the humeral angles of the elytra and sometimes more or less of the base and suture testaceous; the first four joints of the antennae and legs testaceous-yellow. Length 1·5 to 2·5 mm.

Very similar in build to *G. affinis* Sahlb., of Europe, but the penultimate joints of the antennae are shorter, the thorax is broader and the elytra are shorter. Head with a very few irregular punctures, occasionally with a larger pair towards the front. Antennae with the 1st and 2nd joints of equal length, the 3rd much shorter and narrower, the 4th stouter, about as long as broad, the 5th a little longer than broad, the 6th square, the 7th to the 10th scarcely transverse. Thorax twice as broad as long, the disc on either side with a row of three punctures (sometimes not very distinct), the sides with two or three more. Elytra transverse, about one-third longer than the thorax, finely, asperately and exceedingly sparingly punctured. Abdomen with the first two visible segments almost impunctate, the rest exceedingly finely and exceedingly sparingly punctured.

♂. Eighth dorsal segment with a median stout spine and on either side a slightly curved pointed tooth projecting very slightly beyond

the level of the apex of the median spine and separated from it by a semicircular excision.

Hab. Woodlands, in fungus.

69. **Gyrophaena** (s. str.) **granulosa**, n. sp.

Black or pitchy, shining; the thorax and base of the abdomen more or less pitchy-brown, the former biserially punctured on the disc. Elytra testaceous, the postero-external angles more or less dark. Antennae and legs testaceous-yellow. Length 1·2 mm.

A shining species of the build of *G. lucidula* Er., but smaller and narrower. Head strongly transverse with a few scattered punctures on either side of the disc posteriorly, and sometimes with a pair of rather larger ones towards the front. Ground-sculpture very finely strigose. Antennae with the first two joints stout, of equal length, the 3rd shorter and more slender, the 4th small, transverse, the 5th to the 10th transverse, the 11th oval, pointed. Thorax twice as broad as long, the sides rounded; disc with a row of three punctures on either side of the middle line and one or two externally towards the sides; ground-sculpture exceedingly fine, transversely strigose. Scutellum smooth. Elytra broader than, and one-third longer than, the thorax, transverse; the sculpture consisting of fine sparing granules more evident in the ♂; ground-sculpture as on the thorax; the sides with three or four setae. Abdomen very finely and very sparingly punctured.

♂. Seventh dorsal segment with curved transverse row of six small tubercles, of which the central pair are considerably larger than the rest and the lateral are sometimes more or less obsolete. Eighth dorsal segment narrowed and slightly emarginate on either side, thus forming three short processes, the central being bluntly rounded, wider and more produced than the lateral, which are triangular.

Hab. Woodlands and Mandai, in fungus.

70. **Gyrophaena** (s. str.) **crenulata**, n. sp.

Black or pitchy, shining, base and apex of the abdomen more or less ferruginous. Thorax biserially punctured. Elytra testaceous, the postero-external angles black. Antennae and legs testaceous. Length 1·75 mm.

Closely allied to the preceding, from which it differs in the following respects. The size is larger, the base of the abdomen is more extensively ferruginous, the antennae are longer, the 5th joint

is not transverse and the penultimate are less transverse, and the ♂ characters.

♂. Seventh dorsal segment with a very obsolete transverse row of six tubercles; eighth with a large central flat tubercle at the base, the posterior margin on either side of the middle with a feeble emargination so that it presents three rounded crenulations, the central being the largest and most prominent. Elytra more closely sculptured.

Hab. Woodlands, in fungus.

71. **Gyrophaena** (s. str.) **cristata**, n. sp.

Minute, pitchy, shining; the thorax, base of the elytra and more or less of the base and apex of the abdomen dirty-testaceous. Thorax biserially punctured, no visible ground-sculpture. Antennae and legs testaceous. Length ·6 mm.

A very minute species of the build of *G. minima* Er. The head pitchy, the sides punctured but without visible ground-sculpture. Antennae with the first two joints equal, the 3rd much smaller and shorter, the 4th minute, transverse, the 5th to the 10th transverse, gradually increasing in breadth, the penultimate about twice as broad as long, the 11th moderately long, oval, pointed. Thorax obscure testaceous, twice as broad as long, the disc on either side with a row of three punctures, and external to the second in the row is a still larger one, otherwise the surface is impunctate and without ground-sculpture. Elytra broader, and a little longer than the thorax, obscurely lighter at the base; sculpture consisting of very fine and very sparing granules. Abdomen exceedingly finely and exceedingly sparingly punctured, the sides with short black setae.

♂. Postero-external angles of the elytra with a strong, raised, oblique crest; eighth dorsal abdominal segment narrowed and rounded.

Hab. Mandai, in fungus.

72. **Gyrophaena** (s. str.) **bidens**, n. sp.

Minute, black or pitchy, shining; the thorax, humeral angles of the elytra, base and apex of the abdomen more or less pitchy-testaceous, the former without biserial punctures; first four joints of the antennae and legs testaceous. Length 1 mm.

Of the build of *G. lucidula* Er., but smaller and narrower. Head exceedingly finely and exceedingly sparingly punctured, ground-sculpture strigose. Antennae moderate, the 3rd joint much shorter

and narrower than the 2nd, the 4th very small, transverse, the 5th to the 10th transverse, the penultimate nearly two and a half times broader than long. Thorax nearly twice as broad as long, exceedingly finely and exceedingly sparingly punctured, the middle of the disc impunctate; ground-sculpture distinct, transversely strigose. Elytra transverse, a little longer and broader than the thorax, exceedingly finely and exceedingly sparingly punctured; ground-sculpture as on the thorax. Abdomen exceedingly finely and exceedingly sparingly punctured and pubescent.

♂. Eighth dorsal segment produced on either side into a rather stout, slightly incurved spine, the posterior margin between these, bisinuate.

Hab. Woodlands, in fungus.

73. **Gyrophaena** (s. str.) **dubia,** n. sp.

Shining, black, thorax pitchy, elytra pitch-black, obscurely testaceous at the base and humeral angles; base and apex of the abdomen reddish-testaceous. Thorax very finely and irregularly punctured, the middle of the disc impunctate; first three joints of the antennae and legs testaceous. Length 1 mm.

Of the build of *G. poweri* Crotch, but smaller and narrower. Head with a few scattered punctures, irregular in size and distribution. Antennae with the 3rd joint small, much shorter than the 2nd, the 4th to the 10th transverse, the penultimate one and a half times broader than long. Thorax twice as broad as long, with a few fine, scattered, unequal and irregular punctures, the central part of the disc impunctate. Elytra transverse, broader and a little longer than the thorax, exceedingly finely and exceedingly sparingly punctured. Abdomen exceedingly finely and exceedingly sparingly punctured.

♂. Unknown.

Hab. Woodlands, under bark.

74. **Gyrophaena** (s. str.) **irregularis,** n. sp.

Shining, pitchy-testaceous, elytra testaceous, more or less infuscate towards the postero-external angles. Abdomen reddish-testaceous, the fifth to the seventh segments blackish; disc of the thorax irregularly punctured, the sides impunctate. Antennae and legs testaceous. Length 1 mm.

Of the build of *G. minima* Er., but rather smaller. Head with several moderately large punctures on either side, the front and

centre of the disc impunctate. Antennae rather long, the first two joints stouter of equal length, the 3rd much shorter and narrower, the 4th very small, the 5th square, the 6th to the 10th very slightly transverse, the 11th oval pointed. Thorax twice as broad as long, the sides evenly rounded; the disc with moderately fine sparing, irregular puncturation, not leaving any smooth impunctate area in the middle. Scutellum smooth. Elytra transverse, broader and a little longer than the thorax, finely, uniformly and not closely punctured. Abdomen very finely and very sparingly punctured, the seventh segment smooth.

♂. Eighth dorsal segment with a short, stout, blunt, slightly incurved tooth on either side.

Hab. Bukit Panjang, in fungus.

75. **Gyrophaena** (s. str.) **moultoni,** n. sp.

Reddish-yellow, shining; the elytra (except the base) and fourth and fifth abdominal segments fusco-testaceous; head and thorax exceedingly finely and uniformly punctured. Antennae and legs testaceous, often the last eight joints of the former more or less infuscate. Length ·75 mm.

Of the build of *G. minima* Er., but much smaller. Head with a moderately large puncture on either side of the disc and a few very fine scattered ones as well. Antennae with the first three joints pale testaceous, the rest often more or less infuscate, the 1st and 2nd joints of equal length, the 3rd much shorter and narrower, the 4th small, scarcely transverse, the 5th to the 10th transverse, gradually increasing in width, the penultimate not double as broad as long, the 11th stout, oval, as long as the two preceding together. Thorax twice as broad as long, the sides evenly rounded, very finely, uniformly and sparingly punctured and pubescent. Scutellum impunctate. Elytra transverse, fusco-testaceous, lighter at the base, a little longer than the thorax, very finely, uniformly and not very closely punctured. Abdomen obscurely fuscous on the fourth and fifth segments, very finely and very sparingly punctured and pubescent, the sides and apex with short black setae.

♂. Seventh dorsal segment with a flat, semicircular tubercle in front of the posterior margin in the middle. Eighth with a small triangular excision on either side of the middle of the posterior margin, so that a short, blunt triangular process is formed in the middle and the lateral margins form sharp triangular teeth.

Hab. Bukit Timah and Bukit Panjang, in fungus.

76. **Gyrophaena (Phaenogyra) metallica**, n. sp.

Black, shining, thorax often pitchy, the head, thorax and elytra with copper-bronze metallic reflex; base of the abdomen more or less reddish; first three joints of the antennae and legs yellow-testaceous. Thorax irregularly punctured on the disc. Length 1·5 to 1·75 mm.

Readily distinguished by the metallic reflex of the fore-parts. Head but slightly transverse with three or four punctures on either side of the disc. Antennae with the 1st and 2nd joints stout and of about equal length, the 3rd much shorter and smaller, the 4th very small, transverse, the 5th much larger, slightly transverse, the 6th to the 10th slightly transverse, the 11th oval, pointed. Thorax about half as broad again as long, the sides but slightly rounded; puncturation irregular in size, sparing and limited to the disc, the sides being impunctate, often a larger puncture is visible on either side of the middle before the base. Elytra a little longer and broader than the thorax, very finely and very sparingly punctured. Abdomen practically impunctate.

♂. Seventh dorsal segment with an obsolete tubercle on either side of the middle line in front of the posterior margin. Eighth dorsal segment with a rather slender slightly incurved spine on either side, the border between these with two minute teeth separated by a feeble emargination, and much nearer the lateral spines than to each other.

Hab. Bukit Timah, in fungus.

Sternotropa, n. gen.

Mandibles short and stout, the right with a small blunt tooth in the middle of the inner margin. Tongue divided almost to the base into two narrow-pointed lobes which extend to the level of the extremity of the 1st joint of the labial palpi. Labial palpi 2-jointed, the 1st stout, moderately long, the 2nd much narrower but quite as long as the 1st, cylindrical with rounded apex. Maxillary palpi 4-jointed, the 1st joint short, the 2nd moderately long, a little thickened towards the apex, the 3rd longer than the 2nd, the 4th slender, subulate, more than half as long as the 3rd. Prosternum without intercoxal process. Mesosternal process moderately broad, finely keeled, the intermediate coxae distant. Tarsal formula 4, 4, 5. The 1st and 2nd pairs with the first three joints short, subequal, the 4th as long as the three preceding together; the 3rd pair much as in the preceding, and with the last joint equal to

the three preceding together. Elytra distinctly emarginate internal to the postero-external angles.

The genus is allied to *Pseudoligota*, but differs in the longer and more deeply divided tongue, the much longer 2nd joint of the labial palpi, the carinate mesosternum and the distinctly sinuate elytra internal to the postero-external angles.

77. Sternotropa nigra, n. sp.

Short, robust, black, shining, elytra often dark chestnut-brown; the first three joints of the antennae and legs testaceous-yellow, the rest of the former more or less infuscate. Length 1·3 mm.

Of the build of *Oligota granaria* Er., which it much resembles except in the build of the antennae. Head large, transverse, scarcely perceptibly and very sparingly punctured, pubescence yellowish, very fine and sparing; eyes large, not prominent. Antennae moderately long, the 1st and 2nd joints of about equal length, the 3rd a little shorter and more slender than the 2nd, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate about twice as broad as long, the 11th oval, longer than the two preceding together. The thorax fully twice as broad as long, widest about the middle, the sides evenly rounded, the anterior angles obtuse, the posterior rounded; the posterior border margined, feebly bisinuate; puncturation and pubescence fine, not very close. Elytra about as long as, and scarcely broader than, the thorax, transverse, finely, somewhat asperately and not very closely punctured and pubescent, distinctly sinuate internal to the postero-external angles. Abdomen finely and not very closely punctured and pubescent, the seventh and eighth segments much more sparingly; the sides with moderately long setae.

♂. Eighth dorsal segment with a pointed tooth on either side of the middle line, separated by a nearly semicircular emargination.

Hab. Woodlands, in fungus.

78. Sternotropa ruficollis, n. sp.

Black, shining, the thorax and base and apex of the abdomen reddish-testaceous. Antennae pitchy; legs testaceous. Length 1·3 mm.

Of the size and build of the preceding. Head transverse, black, shining, scarcely perceptibly and exceedingly sparingly punctured. The antennae are stouter than in the preceding species, but the

4th and 5th joints are not transverse, but a trifle longer than broad, otherwise similarly constructed. The thorax is shorter than in the preceding and more sparingly punctured. The elytra are transverse, a little longer, but scarcely broader than the thorax, with puncturation and pubescence as in the preceding. The abdomen is reddish-testaceous with the fifth and sixth segments blackish, the puncturation as in the preceding.

♂. Suture of the elytra with a row of three obsolete granules towards the posterior part; seventh dorsal segment of abdomen with a minute tubercle on either side of the middle line in front of the posterior margin; eighth dorsal segment with a moderately long, pointed, slightly incurved tooth on either side of the posterior margin.

Hab. Mandai, in fungus.

Adelarthra, n. gen.

Maxillary palpi 4-jointed; the 1st joint small; the 2nd curved, dilated towards the extremity; the 3rd longer and broader than the 2nd, oval; the 4th narrow, elongate, subulate, quite half the length of the 3rd. The tongue broad, transverse, its sides and apex rounded, deeply bilobed. Labial palpi 3-jointed, the 1st joint stout, elongate, slightly curved; the 2nd much narrower but about as long as the 1st; the 3rd minute, subulate, scarcely visible. Inner lobe of the maxilla broad, obliquely truncate, closely pectinate; the outer lobe rather broad, slightly curved with apex ciliate. Mandibles short and stout and appear simple. Prosternum broadly emarginate posteriorly, not produced at all between the anterior coxae; prothoracic episterna small, triangular, the epimera wanting. Middle coxae distant; the mesosternum broad, finely keeled in the middle line, emarginate posteriorly and receiving the metasternal process. Elytra with lateral margins furnished with three long and strong setae, the epipleura not complete, failing posteriorly. Tarsal formula 4, 4, 5. The first pair with the first three joints short and subequal, the 4th joint as long as the three preceding together; the second pair with the first three joints short and subequal, the 4th joint longer than the three preceding together; the third pair with the 1st joint moderately long, the 2nd, 3rd and 4th gradually decreasing in length, the 5th longer than the two preceding together. The middle and posterior tibiae each with a distinct seta about the middle of the external border. Abdomen with the sides and upper surface setiferous.

In build this genus in well-extended examples much

resembles *Oligota apicata* Er., but is more elongate; retracted specimens are very similar to *Pseudoligota* in appearance, from which the strong setae of the elytra readily distinguish it.

79. **Adelarthra barbara,** n. sp.

Rather robust, convex, attenuate posteriorly, shining, dark pitchy-red, the elytra pitchy-black; the third, fourth and eighth abdominal segments reddish-testaceous; the legs and first four joints of the antennae testaceous, the rest of the latter black. Length 1·2 mm.

Head transverse, narrowed and rounded behind the eyes, the temples passing insensibly into the base; the eyes large, not prominent; glabrous and without visible sculpture. Antennae moderately long, the 1st and 2nd joints of about equal length, the 3rd shorter and narrower, the 4th transverse, smaller than the following, the 5th to the 10th slightly transverse but not increasing in breadth, the 11th elongate, oval, pointed, as long as the two preceding together. Thorax strongly transverse, nearly twice as broad as long, broadest posteriorly, the sides gradually narrowed and rounded to the anterior angles and with a short seta behind the middle; the base bisinuate, not bordered, the posterior angles obtuse; the disc with a small puncture on either side of the middle. Scutellum concealed. Elytra transverse, as long as, but broader than, the thorax, emarginate internal to the postero-external angles, sparingly, finely and asperately punctured and with (for a small species) rather coarse, long, yellowish, sparing pubescence and on each side with three long and stout black setae. Abdomen pointed, practically impunctate, the third and fourth segments with fine curved lines forming about ten or twelve half-hoops with the convexity forwards, the posterior extremities of the adjacent ones being crossed; the fifth, sixth and seventh segments impressed with fine parallel longitudinal lines, which in the seventh segment, however, are limited to the base. The sides are strongly setose, and the upper surface of each segment near the side except the first and second carries an erect black seta.

Hab. Bukit Timah, in rotten logs associated with Ants and Termites. Sembawang, in débris.

80. **Hetairotermes,** n. n. (**Termophila,** Lea, *nom. praeoc.*) **agilis,** n. sp.

Shining, castaneous, the abdomen pitchy-testaceous; mouth-

parts, legs and antennae testaceous, the intermediate joints of the latter more or less infuscate. Elytra impunctate on the disc. Length 1·6 mm.

In size, colour and build very similar to *Termophila latebricola* Lea, of Australia, the sides of the elytra are, however, distinctly punctured in the present species. Head concealed by the thorax up to the posterior borders of the eyes, which are large but not prominent, impunctate and glabrous. Antennae compact, setose, the 1st joint short and stout, the 2nd and 3rd subequal, longer than the 1st, the 4th to the 8th a little longer than broad, gradually decreasing in length, 9th and 10th as long as broad, the 11th elongate, pointed, about as long as the two preceding together. Thorax strongly transverse, widest at the middle, the sides equally narrowed and rounded anteriorly and posteriorly, margined, passing insensibly into the base, impunctate and glabrous except for a few setiferous punctures on the disc and towards the sides. Elytra as long as, but narrower than, the thorax, transverse, obliquely truncate posteriorly, the disc glabrous and impunctate, the sides and postero-external angles finely and moderately closely punctured and pubescent, the sides of the disc with a few fine erect setae. Abdomen narrowed posteriorly, deeply margined, finely and moderately closely punctured, pubescence rather long and rather coarse, interspersed with erect setae, the sides and apex finely setose. Intermediate and posterior tibiae with several long setae; tarsi pointed.

Hab. Associated with a wood-dwelling Termite. Woodlands.

81. **Hetairotermes piceus**, n. sp.

Shining, pitchy; mouth-parts, legs and antennae testaceous. Elytra uniformly punctured. Length 1·6 mm.

Very similar to the preceding, but of uniform pitchy-black colour, the antennae with the intermediate joints scarcely infuscate and a little longer, and with the 11th scarcely longer than the 10th. The elytra are a little longer and uniformly but very sparingly covered with fine setiferous punctures.

Hab. With a wood-dwelling Termite, Bukit Timah.

Pseudatheta, n. gen.

Labrum transverse, the anterior angles rounded. Mandibles rather stout, curved, pointed, the right with a distinct tooth on inner margin. Maxillary palpi 4-jointed, the 1st joint small, 2nd

elongate, gradually thickened towards the apex. 3rd slightly longer and stouter than the 2nd, 4th subulate fully half as long as the 3rd. Inner lobe of the maxilla narrow, lightly incurved and pointed at the apex, pectinate internally; outer lobe broader than the inner, narrowed and pointed at the apex which is ciliate. Tongue narrow and elongate, nearly extending to the level of the apex of the first joint of the labial palpi, bifid at the extremity. Paraglossae distinct, ciliate, not extending beyond the apex of the tongue. Labial palpi 3-jointed, the 1st joint moderately long, cylindrical, the 2nd narrower and about half as long as the 1st, the 3rd narrower and about twice as long as the 2nd, cylindrical. Gular sutures distant, slightly divergent behind. Temples bordered below. Prosternum broadly rounded behind. Mesosternal process narrow and pointed, extending two-thirds along the coxae, which are narrowly separated. Metasternal process rounded at the apex. Tarsal formula 4, 4, 5. The first pair of tarsi with the first three joints short and subequal, the 4th longer than the three preceding together; the second pair with the first two joints short and subequal, the 3rd a little longer, the 4th longer than the three preceding together; the third pair with the 1st joint moderately elongate, the 2nd, 3rd and 4th gradually decreasing in length, the 5th longer than the two preceding together. Elytra sinuate internal to the postero-external angle. Superficially the species on which this genus is founded might be taken for an *Atheta* of the *nigritula* group.

82. **Pseudatheta elegans,** n. sp.

Rufo-testaceous, moderately shining, the elytra (except the base), the posterior half of the fifth and the whole of the sixth abdominal segments black; the first three joints of the antennae and the legs testaceous. Length 1·75 mm.

Head transversely orbicular, darker in colour than the thorax; eyes moderate; very finely and indistinctly punctured, finely pubescent. Antennae moderate, the first three joints subequal, the 4th to the 10th transverse, the penultimate two and a half times as broad as long, the 11th large, oblong-oval, longer than the two preceding together. Thorax transverse one and a half times broader than long, widest just before the middle, the sides bordered, narrowed and rounded anteriorly, converging posteriorly in a nearly straight line to the obtuse posterior angles, the base bordered and feebly sinuate on either side; puncturation fine and moderately close, finely pubescent. Scutellum ferruginous, transverse, very finely punctured. Elytra transverse a little longer and broader than the thorax, black, the base more or less rufo-testaceous, very

finely, closely and asperately punctured, finely pubescent. Abdomen a little narrowed behind, the first four visible segments very finely and rather closely punctured and pubescent, the last two segments much more sparingly punctured.

♂. Suture of elytra elevated posteriorly and on either side with a small tubercle. Seventh abdominal segment with two more or less transverse rows of small tubercles; eighth abdominal segment truncate, the margin very obscurely crenulate, the surface finely granulate.

Hab. Fungus; Bukit Timah, Woodlands, Mandai.

Pelekoglossa, n. gen.

Maxillary palpi 4-jointed, the 1st joint small, the 2nd elongate, narrow at the base, lightly curved and widened towards the apex, the 3rd a little longer than the 2nd, gradually and slightly dilated towards the extremity, the 4th subulate, more than half as long as the 1st, the apex indistinctly segmented into two small supplementary joints. Inner lobe of the maxilla furnished with short teeth along the inner margin anteriorly, and with longer ones posteriorly; outer lobe pectinate at apex. Tongue short and broad, halberd-shaped, the posterior portion corneous, the anterior membranous, the front border broadly rounded. Labial palpi 2-jointed, the 1st joint rather short, broad, the antero-external angle prominent and with a long seta, the inner border constricted before the apex, the 2nd joint as long as, but much narrower than, the 1st, lightly curved, the apex rounded. Paraglossae wanting. Gular sutures distant, divergent posteriorly. Temples bordered below. Prosternum broadly rounded behind; mesosternum triangular, the apex bluntly pointed, scarcely extending half the length of the middle coxae which are moderately separated; metasternum broadly rounded at apex, not nearly reaching the mesosternum. Tarsal formula 4, 4, 5; the anterior pair with the first three joints short and subequal, the 4th as long as the three preceding together; middle pair with the first three joints rather short, but all distinctly longer than broad and gradually decreasing in length, the 4th as long as the three preceding together; posterior pair with the 1st joint nearly twice as long as the 2nd; 2nd, 3rd and 4th subequal, two and a half times longer than broad, the 5th longer than the two preceding together. Middle tibiae with a distinct seta. Elytra not sinuate. The facies of the species on which this genus is founded is very similar to that of the *Acrotona* group of *Athela*.

83. **Pelekoglossa cingulata,** n. sp.

Pitchy, moderately shining; the thorax, base and apex of the abdomen, obscure reddish-testaceous; first three joints of the antennae fusco-testaceous; legs testaceous. Length 1·4 mm.

Head pitchy-black, suborbicular, finely and pretty closely punctured, finely pubescent. Antennae stout, the 1st and 2nd joints subequal, the 3rd shorter, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate two and a half times broader than long, the 11th stout, its apex broadly rounded. Thorax half as broad again as long, the sides evenly rounded, the posterior angles rounded passing insensibly into the base which is lightly bisinuate; puncturation fine and moderately close, finely pubescent. Elytra a little longer and broader than the thorax, finely, closely and asperately punctured and finely pubescent. Abdomen narrowed behind, the fifth to the seventh segments more or less pitchy, the rest more or less obscure, reddish-testaceous, exceedingly finely and moderately closely punctured and finely pubescent throughout.

♂. Eighth dorsal segment with a short, sharp tooth on either side, and with four short blunt teeth placed close together in the middle of the posterior margin; sixth ventral segment a little produced, narrowed and rounded.

Hab. Mandai, in rotting fruit.

84. **Placusa** (s. str.) **conura,** n. sp.

Pitchy, greasy lustrous; the head blackish; elytra testaceous, infuscate about the scutellum; first three joints of the antennae, mouth-parts and legs testaceous; penultimate joints of the antennae transverse; intermediate and posterior tibiae with a single seta. Length 2 mm.

Build of *P. tachyporoides* Walk., of Europe, but smaller, more brightly coloured, with the antennae much more slender and the puncturation of the head, thorax and elytra much finer. Head transverse, black or blackish, the temples rounded, the eyes large; puncturation very fine and moderately close, finely pubescent. Antennae with the 2nd and 3rd joints of equal length, the 4th and 5th as long as broad, the 6th to the 10th transverse, gradually becoming shorter so that the thickness of the antenna is but little increased, the 11th rather stout, as long as the two preceding together. Thorax transverse, brown, the sides lighter, more than one-third as broad again as long, the sides gently rounded, the posterior angles rounded, very finely and rather closely punctured,

finely pubescent. Elytra as long as, and a little broader than, the thorax, scarcely sinuate, very finely and rather closely punctured and pubescent. Abdomen pointed, often lighter at the base and apex, very finely and closely punctured and pubescent throughout, the sides and apex setiferous.

♂. Posterior margin of the eighth dorsal segment finely crenulate; sixth ventral segment a little narrowed and produced.

Hab. Labrador Villa, in rotting fruit.

85. **Placusa bispina,** n. sp.

Pitchy-black, slightly shining; elytra obscure testaceous and first three joints of the antennae testaceous. Legs testaceous. Length 1·6 mm.

Very similar to the preceding but smaller, the antennae shorter, the 5th joint distinctly transverse, the penultimate joints more transverse and the thorax shorter and more transverse and with different ♂ characters. Head black or pitchy-black, transverse, finely closely and somewhat roughly punctured, finely pubescent. Antennae with the 3rd joint shorter than the 2nd, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate nearly twice as broad as long. Thorax twice as broad as long, pitchy, the sides rounded and more strongly contracted anteriorly than posteriorly, the posterior angles rounded; the base on either side slightly emarginate; puncturation fine and rough, closer than on the head, finely pubescent. Elytra about one-third longer than the thorax, slightly transverse, of an obscure dirty testaceous colour, darker about the scutellum, finely, closely and roughly punctured, finely pubescent. Abdomen a little narrower behind, densely and finely punctured and pubescent throughout.

♂. Eighth dorsal segment deeply excavated on either side, so that the lateral margins form a long sharp incurved spine and the central portion a lobe with broadly rounded apex, not extending beyond the lateral spines, with a broad flat tubercle before the apex.

Hab. Mandai, Bukit Panjang, in rotting fruit.

86. **Placusa** (s. str.) **lobata,** n. sp.

Black, moderately shining, the elytra fusco-testaceous, the abdomen pitchy; first three joints of the antennae pitchy-brown; legs testaceous. Length 1·1 to 1·2 mm.

Very similar to *P. pumilio* Gr., in build, but much smaller and the thorax not so broad. Head finely, somewhat asperately and closely punctured. Antennae with the 3rd joint distinctly shorter

than the 2nd, the 4th small, transverse, the 5th broader, the 6th to the 10th gradually increasing in breadth, the penultimate two and a half times as broad as long, the 11th stout, the apex rounded. Thorax more than half as broad again as long, the sides evenly rounded, the base bisinuate, puncturation very similar to that of the head, finely pubescent. Elytra a little longer but scarcely broader than the thorax, slightly transverse, finely and closely punctured, finely pubescent. Abdomen parallel, pitchy, lighter at the base, very finely and closely punctured and pubescent throughout.

♂. Eighth dorsal segment triangularly produced, the apex rounded, deeply emarginate on either side, the emargination bounded by a long, pointed, incurved spine; sixth ventral segment produced, narrowed and rounded.

Hab. Pasir Panjang, Bukit Panjang, in rotting fruit.

87. **Placusa** (s. str.) **notabilis,** n. sp.

Head black, thorax and abdomen pitchy, moderately shining, the elytra fusco-testaceous, the first two joints of the antennae obscure testaceous; legs testaceous. Length 1 mm.

A small parallel species, with pitchy thorax which is not so broad as in the preceding and with finer puncturation. Head black, very finely and closely punctured, the antennae constructed as in the preceding species. Thorax pitchy, one-third as broad again as long, the sides evenly rounded, the base scarcely bisinuate, very finely and closely punctured and pubescent. Elytra a little longer and a little broader than the thorax, slightly transverse, very finely and closely punctured and pubescent. Abdomen parallel, pitchy, lighter at the base, very finely and closely punctured and pubescent throughout.

♂. Eighth dorsal segment with three equal and closely-placed teeth at the middle of the posterior border, which is deeply emarginate on either side, the emargination bounded externally by a long, sharp, incurved spine; third dorsal segment either with (1) the posterior border triangularly produced in the middle into a short lobe with rounded apex, broadly emarginate on either side, the emargination bounded externally by a stout spine extending nearly to the level of the posterior margin of the fourth segment, or (2) the posterior border more shortly but more broadly produced, the apex itself with a small emargination, the lateral teeth shorter, or (3) the posterior border not at all produced in the middle, the lateral teeth only present as in (2).

Hab. Labrador Villa, Mandai, in rotting fruit.

Pseudoplacusa, n. gen.

Labrum transverse, the side and anterior angles rounded, the anterior margin very slightly emarginate. Mandibles not very stout, lightly curved and pointed at the apex, the right crenulate, the left simple. Maxillary palpi 4-jointed, the 1st joint small, the 2nd narrowed at the base, moderately enlarged towards the apex, the 3rd about as long and as stout as the 2nd, the 4th subulate, about half as long as the 3rd. Inner lobe of the maxilla narrow and pointed, the inner margin strongly pectinate; outer lobe broader than the inner, the apex ciliate. Tongue very narrow and elongate, extending beyond the level of the apex of the 1st joint of the labial palpi and bifid at the extremity. Paraglossae distinct, ciliate, extending to the level of the middle of the 1st joint of the labial palpi. Labial palpi 2-jointed, the 1st joint elongate, cylindrical, the 2nd cylindrical, fully as long but not so stout as the 1st. Gular sutures distant, slightly divergent posteriorly. Temples bordered below. Prosternum short, obtusely angled posteriorly in the middle line; mesosternal process narrow and pointed, extending one-half the length of the intermediate coxae, which are narrowly separated. Tarsal formula 4, 4, 5, the first pair with the first three joints short and subequal, the 4th joint longer than the three preceding together; the middle pair similarly built, but with the individual joints longer; the posterior pair with the 1st joint short, the 2nd, 3rd and 4th longer, subequal, the 5th rather longer than the two preceding together. Tibiae ciliate. Elytra distinctly sinuate internal to the postero-external angles. The species on which the genus is founded has a facies very similar to *Placusa*, but in the structure of the mouth-parts approaches *Diestota*.

88. **Pseudoplacusa rufiventris**, n. sp.

Rufo-testaceous, moderately shining, the head and elytra pitchy-black. Mouth-parts and legs testaceous. Length 2·1 mm.

Head transverse, subpentagonal, rather large, ensconced in the thorax and leaving but little of the temples visible, the eyes large and moderately prominent; very finely and closely punctured and finely pubescent. Antennae reddish-testaceous, the 2nd and 3rd joints of equal length, a little shorter than the 1st, the 4th and 5th about as long as broad, the 6th to the 10th transverse gradually increasing in breadth, the penultimate scarcely twice as broad as long, the 11th elongate pointed, longer than the two preceding together. Thorax transverse, half as broad again as long, widest at the middle, from thence rounded and narrowed both anteriorly

and posteriorly, but rather more posteriorly, the sides and base bordered, the latter distinctly sinuate on either side, the posterior angles obtuse, very finely and closely punctured and pubescent. Elytra a little longer and broader than the thorax, transverse, very finely and closely punctured and pubescent, the puncturation being, however, distinctly less fine than that of the thorax. Abdomen distinctly and gradually narrowed posteriorly, finely and closely punctured and pubescent, the puncturation, however, being less fine and less close than on the elytra, the last two segments much more sparingly punctured; the sides with sparing short setae, the apex with longer ones.

♂. Seventh abdominal segment with a fine longitudinal keel in the middle line reaching the posterior margin but evanescent anteriorly.

Hab. Rotting fruit of a wild nutmeg, Mandai.

Chiledophila, n. gen.

Labrum transverse, the sides and anterior angles rounded, the anterior margin feebly sinuate on either side of the middle line. Mandibles rather stout, pointed at the apex, the right with a small tooth at the middle of the inner margin, which is crenulate between the tooth and the apex; the left simple. Maxillary palpi 4-jointed, the 1st joint small and short, the 2nd elongate, narrowed at the base gradually thickened to the apex, the 3rd shorter and stouter than the 2nd, widest at the apex, the 4th subulate fully half as long as the 3rd. Inner lobe of the maxilla rather narrow, strongly pectinate along the inner margin; outer lobe narrower than the inner, the apex strongly pectinate. The tongue oblong, extending to the level of the apex of the 1st joint of the labial palpi, triangularly emarginate in the middle of the apical margin. Paraglossae distinct, ciliate. Labial palpi 2-jointed; the 1st joint moderately long and stout, distinctly constricted on the inner margin near the base, the 2nd shorter and narrower than the 1st, a little enlarged towards the apex. Gular sutures distant, diverging posteriorly. Temples bordered below. Prosternum truncate posteriorly without intercoxal process. Mesosternal process narrow and pointed, extending half the length of the coxae, which are but narrowly separated. Metasternal process narrow, emarginate in front at its junction with the mesosternal process. Tarsal formula 4, 4, 5; the anterior pair with the first three joints short and subequal, the 4th as long as the three preceding together; the middle pair with the first three joints rather short and subequal, the 4th as long as

the three preceding together; the posterior pair with the first four joints rather short (but longer than those of the middle pair), subequal, the 5th about as long as the two preceding together. Tibiae finely ciliate. Elytra sinuate internal to the postero-external angles. The species on which the genus is founded has somewhat the appearance of an *Oxypoda*.

89. **Chledophila annularis**, n. sp.

Narrow, elongate, scarcely shining, rufo-testaceous, the head pitchy-red; elytra, sixth abdominal segment and last seven joints of the antennae fuscous; mouth-parts, legs and first four joints of the antennae testaceous. Length 2·1 mm.

Head pitchy-red, transversely quadrate, the temples very slightly convergent posteriorly, almost straight; the eyes rather large but not prominent; finely and closely punctured and pubescent; antennae with the first three joints subequal, the 4th as long as broad, the 5th to the 10th transverse, the penultimate two and a half times broader than long, the 11th stout bluntly pointed. Thorax reddish-testaceous, transverse half as broad again as long, widest at the middle, from thence contracted and feebly rounded both in front and behind, but more strongly posteriorly; posterior angles obtuse; the sides and base finely bordered; puncturation and pubescence fine and close. Elytra a little longer and broader than the thorax, transverse; puncturation much more distinct than that of the thorax, fine, close and asperate, pubescence fine and close. Abdomen elongate, nearly parallel, very slightly narrowed at apex, finely and closely punctured and pubescent, rather more sparingly on the seventh and eighth segments.

♂. Elytra with a minute tubercle on either side of the suture anteriorly; second abdominal segment with a small tubercle in front of the posterior margin in the middle, the third with a broad tubercle in front of the posterior margin in the middle.

Hab. In débris, Bukit Panjang.

Neosilusa, n. gen.

Labrum transverse, the anterior margin truncate, the sides and anterior angles rounded. Mandibles rather stout, curved, pointed, the right with a tooth at the middle of the inner border, the left simple. Maxillary palpi 4-jointed, the 1st joint small, the 2nd elongate, slightly thickened towards the apex, the 3rd a little longer than the 2nd and stouter at the apex, the 4th subulate, one-third the length of the 3rd. Inner lobe of the maxilla narrow

and elongate, the inner margin of the apical third furnished with short strong teeth, the middle third set with longer pectinations; outer lobe membranous, triangular, the apex ciliate. The tongue narrow, elongate, a little narrower at the base and slightly widened and rounded at the apex, about half as long as the first joint of the labial palpi. Paraglossae distinct ciliate. Labial palpi 2-jointed, the suture between the joints indistinct, styliform, the 1st joint elongate, the 2nd fully as long as the 1st. Gular sutures distant, diverging posteriorly. The temples bordered below. Prosternum pointed behind. Mesosternal process narrowed and rounded posteriorly, the intermediate coxae moderately distant. Metasternal process truncate. Tarsal formula 4, 4, 5; the anterior tarsi with the first three joints rather short and subequal, the 4th as long as the three preceding together; the middle tarsi with the first three joints moderately short (but longer than those of the anterior pair), subequal, the 4th as long as the three preceding together and furnished with an appendage near the apex; the posterior with the first four joints elongate, gradually decreasing in length, the 5th nearly as long as the two preceding together and with an appendage near the apex. Tibiae ciliate. Elytra distinctly sinuate internal to the postero-external angle.

I found this genus on *Silusa ceylonica* Kr., a species occurring in Singapore in rotting fruit. The facies is very different to that of the European species of *Silusa*, and much more nearly approaches that of *Gyrophaena*, the thorax is much more strongly contracted behind, and the structure of the mesosternum is different.

90. **Neosilusa moultoni**, n. sp.

Pale reddish-brown, rather shining, the sides and postero-external angles of the elytra and the fifth and sixth abdominal segments more or less pitchy; the antennae, legs and mouth-parts reddish-testaceous. Length 2 mm.

Very similar to *Silusa* (*Neosilusa*) *ceylonica* Kr., but at once distinguished by the more shining fore-parts, paler coloration, coarser but less rugose puncturation of the head and thorax, and the less strongly contracted sides of the thorax posteriorly. Head subpentagonal, the eyes moderately large and prominent, closely and coarsely punctured, rather shining. Antennae moderately long and stout, the first three joints subequal, the 4th slightly longer than broad, the 5th as long as broad, the 6th to the 10th gradually increasing in breadth, the 11th elongate oval. Thorax strongly transverse, more than one and a half times as broad as long, widest

before the middle, the sides from thence rounded and contracted anteriorly, more strongly contracted and sinuate posteriorly to the obtuse posterior angles, the disc with distinct transverse impression before the scutellum and a rounded fovea internal to the posterior angles, strongly and closely punctured, moderately finely and sparingly pubescent, shining. Elytra a little longer and broader than the thorax and rather less coarsely and closely punctured, shining, moderately finely pubescent. Abdomen shining, very finely and very sparingly punctured except at the bases of the anterior segments, which are somewhat coarsely and closely punctured, the seventh and eighth segments nearly impunctate; sides and apex with moderately long setae.

♂. Fourth abdominal segment with a small tubercle on either side of the middle line near the posterior margin; the seventh with six fine raised lines, two placed anteriorly and four in a transverse row posteriorly.

Hab. In fungus, Woodlands.

Ousilusa, n. gen.

Labrum transverse, broadly and slightly emarginate anteriorly, the sides and anterior angles rounded. Mandibles rather stout, curved, pointed, the right one with a tooth at the middle of the inner border, the left simple. Maxillary palpi 4-jointed, the 1st joint small, the 2nd moderately elongate and thickened towards the apex, the 3rd longer than the 2nd and gradually thickened towards the extremity, the 4th subulate, about one-third the length of the 3rd. Inner lobe of the maxilla narrow, the inner margin anteriorly furnished with short stout pectinations, posteriorly with longer and more slender ones; outer lobe broader than the inner, its apex ciliate. The tongue narrow and elongate extending nearly to the level of the apex of the first joint of the labial palpi and split to the middle into two narrow lobes. Paraglossae distinct, ciliate. Labial palpi 2-jointed, the 1st joint elongate a little narrower at the apex before which at the inner border is a constriction, the 2nd as long as but a little narrower than the 1st slightly enlarged towards the apex. Gular sutures distant, divergent posteriorly. Temples bordered below. Prosternal process acuminate. Mesosternal process rather broad, truncate posteriorly, the intermediate coxae distant. Metasternal process broadly rounded at the apex. Tarsal formula 4, 4, 5. The anterior tarsi with the first three joints short and subequal, the 4th longer than the three preceding together; the middle tarsi with the first three joints short (but slightly increasing in length), the 4th longer than

the three preceding together; the posterior tarsi with the first four joints gradually increasing in length, the 5th longer than the two preceding together. Tibiae ciliate. Elytra distinctly sinuate internal to the postero-external angle.

This genus has the facies of *Neosilusa*, and, apart from the structure of the mouth-parts, the two species known to me are at once distinguished from it by the absence of close rugose puncturation of the thorax.

91. **Ousilusa myrmicobia,** n. sp.

Pale rufo-castaneous, shining. Head and elytra coarsely punctured. Mouth-parts, legs, the first three and the last joints of the antennae testaceous, the intermediate joints reddish. Length 2 mm.

Head rather large transverse, the eyes moderately large and prominent, the temples rounded and narrowed posteriorly; puncturation (for a small species) very coarse and close. Antennae with the first three joints subequal, the 4th square, the 5th to the 10th transverse, gradually increasing in breadth, the penultimate two and a half times broader than long, the 11th elongate, pointed, longer than the two preceding together. Thorax strongly transverse, one and a half times broader than long, widest just before the middle, the sides rounded and narrowed anteriorly, contracted posteriorly in a nearly straight line to the obtuse posterior angles, the sides and base bordered, the latter bisinuate, the disc with (? ♂) or without an oval impression in the middle occupying nearly the whole extent, and in front of the posterior margin always with a deeply impressed strongly punctured line; the sides exceedingly finely and very sparingly punctured, the middle and anterior areas (including the impression when present) with fine, shallow umbilicate puncturation becoming evanescent posteriorly and laterally; pubescence distinct, yellow, rather coarse and long. Elytra broader and a little longer than the thorax, transverse, pretty closely and very strongly punctured; pubescence yellow, rather coarse and long. Abdomen very finely and very sparingly punctured, sparingly and rather coarsely pubescent.

Hab. In débris associated with a species of *Pheidole*, for the determination of which I am indebted to Mr. Donisthorpe. Bukit Timah and Sembawang.

92. **Ousilusa castanea,** n. sp.

Dark castaneous, shining; head and thorax finely and uniformly

punctured; the first two joints of the antennae mouth-parts and legs testaceous. Length 2·4 mm.

Head rather large, transverse, the temples rounded and narrowed posteriorly, the eyes large and moderately prominent, the disc longitudinally impressed in the middle, finely and rather closely punctured, finely pubescent. Antennae with the 2nd and 3rd joints of equal length, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate fully twice as broad as long, the 11th elongate, pointed, rather longer than the two preceding together. Thorax strongly transverse, one and a half times broader than long, widest before the middle from thence the sides rounded and narrowed anteriorly, narrowed and slightly sinuate to the obtuse posterior angles, bordered; the base slightly sinuate on either side, bordered; disc posteriorly with a broad impression sometimes obscurely divided into two, and before the base with a transverse row of rather large close punctures, the rest of the surface finely and uniformly punctured and finely pubescent. Elytra broader and a little longer than the thorax, transverse, the sides gently rounded, with a sculpture consisting of larger and smaller superficial punctures, which towards the shoulders tend to become rugose and much closer than those of the disc; pubescence fine. Abdomen more strongly and closely punctured anteriorly especially at the bases of the segments, more finely and sparingly posteriorly, rather finely and sparingly pubescent.

Hab. One specimen in seaweed at Pasir Panjang; another at light on board off the town.

Prosilusa, n. gen.

Labrum transverse slightly produced in front in the middle line, feebly sinuate on either side, the anterior angles rounded. Mandibles rather stout, somewhat prominent, curved at the extremity and pointed, the outer margin with a small notch, the inner border of the right with a tooth. Maxillary palpi 4-jointed, the 1st joint small, the 2nd elongate slightly widened towards the apex, the 3rd as long as, and scarcely wider than the 2nd, the 4th subulate about one-third the length of the 3rd. Inner lobe of the maxilla narrow and elongate, pointed and incurved at the tip, the inner margin furnished with short and stout pectinations anteriorly, and with long and stout pectinations posteriorly; outer lobe narrow, but broader than the inner, ciliate at the apex. The tongue small and rather short, not extending for half the length of the 1st joint of the labial palpi, split nearly to the base into two narrow lobes.

Labial palpi 2-jointed, elongate, styliform, reaching to the extremity of the mandible, the joints of equal length and indistinctly separate. Temples bordered below. Gular sutures distant, slightly divergent behind. Prosternal process acuminate posteriorly. Mesosternum broadly rounded behind, carinate, extending for about one-half the length of the intermediate coxae, which are distant. Metasternal process truncate, not quite meeting the mesosternal process. Tarsal formula 4, 4, 5; the anterior tarsi with the first three joints short and subequal, the 4th longer than the three preceding together; the middle pair similarly constructed; the posterior pair with the first four joints, a little longer than broad, subequal, the 5th as long as the three preceding together. Elytra sinuate internal to the postero-external angles.

The genus has a facies much resembling *Neosilusa*, but differs structurally in the divided tongue and the keeled mesosternum.

93. **Prosilusa rufa,** n. sp.

Rufo-castaneous, shining; the elytra in great part, and the base of the sixth abdominal segment pitchy-black. Antennae, mouth-parts and legs reddish-testaceous. Length 2·5 mm.

Head rather large, transverse, triangularly produced in front, the eyes large and rather prominent, their diameter greater than the length of the temples which are rounded and slightly convergent posteriorly passing insensibly into the base; finely and rather sparingly punctured, finely and sparingly pubescent. Antennae with the 2nd and 3rd joints subequal, not quite so long as the 1st, the 4th to the 10th transverse, gradually increasing in breadth, the 10th fully two and a half times broader than long, the 11th rather large, oval, bluntly pointed, longer than the two preceding together. Thorax strongly transverse, rather more than half as broad again as long, widest before the middle, the sides bordered, contracted and rounded anteriorly, more strongly contracted in a nearly straight line to the obtusely rounded posterior angles, the base bordered and distinctly bisinuate; disc before the scutellum with a deep transverse impression; finely and more closely punctured than the head, finely pubescent. Scutellum finely and indistinctly punctured. Elytra broader and one-third longer than the thorax, transverse, the sides gently rounded, pitchy-black, reddish towards the base, rather more finely and rather less closely punctured than the thorax and finely pubescent. Abdomen finely and rather sparingly punctured, much more so posteriorly, finely and sparingly pubescent, the sides with fine setae.

♂. Seventh dorsal segment with a tubercle in the middle line in front of the posterior margin; eighth dorsal segment at the posterior margin with a rather long straight tooth on either side, the margin between with four or five short blunt teeth.

Hab. Rotting fruit, Botanical Gardens.

Deralia, n. gen.

Mandibles somewhat prominent, moderately stout, curved and pointed at the apex, the right with a tooth at the middle of the inner border. Maxillary palpi 4-jointed, the 1st joint small, the 2nd lightly curved and widened towards the apex, the 3rd a little longer than the 2nd, gradually widened from the base, the 4th narrow, subulate, scarcely half the length of the 3rd. Inner lobe of the maxilla narrow, furnished with short stout pectinations along the inner border anteriorly and with longer, but fully as stout ones posteriorly; outer lobe broader than the inner, the apex ciliate-plumose. The tongue elongate, reaching the level of the middle of the 2nd joint of the labial palpi, narrow at the base widened towards the apex, bifid for about one-fourth its length. Labial palpi 2-jointed, elongate, reaching to the tip of the mandibles, scarcely styliform, the 1st joint long and cylindrical, the 2nd a little longer and slightly narrower than the 1st, bulbous at the apex. Temples bordered below. Gular sutures distant, very slightly divergent posteriorly. Prosternal process obtusely angled; mesosternal process narrow and pointed, extending fully half the length of the intermediate coxae, which are narrowly separated; metasternal process bluntly pointed reaching the preceding. Tarsal formula 4, 4, 5. The 1st and 2nd pairs with the first three joints short and subequal, the 4th as long as the three preceding together; the posterior pair with the first four joints short and subequal, the 5th almost as long as the three preceding together. Tibiae with a seta at the middle of the outer margins. Elytra distinctly sinuate.

This genus is closely allied to *Prosilusa*, *Pseudosilusa*, etc., but is separated therefrom by the narrow mesosternal process and the scarcely styliform labial palpi. The head is pentagonal, the temples being straight and convergent posteriorly to the base.

94. **Deralia fuscipennis**, n. sp.

Pitchy-black, moderately shining, thorax and abdomen (except the fifth and sixth segments which are pitchy) rufo-testaceous.

Antennae fuscous, the first three joints and apex of the last, mouth-parts and legs testaceous. Length 2 mm.

Head about as broad as long, pentagonal, the eyes rather small and not prominent, the temples straight and convergent posteriorly; moderately finely, closely and superficially punctured at the sides and posteriorly almost impunctate in front; finely pubescent. Antennae with the first three joints gradually decreasing in length, the 4th as broad as long, the 5th to the 10th transverse, gradually increasing in breadth, the penultimate three times as broad as long, the 11th rather stout, oval. Thorax transverse, nearly one and a half times broader than long, broadest at the middle, the sides gradually rounded and contracted both in front and behind, but more strongly posteriorly, posterior angles obtuse a little prominent; sides and base bordered, the latter scarcely bisinuate; disc transversely impressed in front of scutellum and with a large puncture on either side between the impression and the posterior angles; puncturation moderately fine and moderately close somewhat asperate; pubescence fine. Scutellum transverse, coriaceous. Elytra a little longer and broader than the thorax, the sides nearly straight, moderately finely, moderately closely and asperately punctured; finely pubescent. Abdomen very finely and sparingly punctured and pubescent, finely coriaceous.

Hab. In rotten wood, Bukit Timah.

Pseudophaena, n. gen.

Labrum transverse, truncate anteriorly, the sides and anterior angles rounded. Mandibles rather stout, curved pointed, the right with a tooth at the middle of the inner margin, the left simple. Maxillary palpi 4-jointed, the 1st joint small, the 2nd elongate, lightly curved and widened towards the apex, the 3rd as long as, but stouter than the 2nd, the 4th much narrower and about half as long as the 3rd, cylindrical. Inner lobe of the maxilla narrow, the inner margin anteriorly furnished with short stout pectinations, posteriorly with much longer and stouter ones; outer lobe ciliate-plumose at the apex. The tongue narrower at the base, widened anteriorly and divided for one-third of its length, and extending to the level of the middle of the 1st joint of the labial palpi. Paraglossae distinct, ciliate. Labial palpi 2-jointed, the 1st joint elongate, distinctly constricted at the middle of the inner margin, the 2nd nearly half as long as, but narrower than the 1st, bulbous at the tip. Gular sutures distant, diverging behind. Temples bordered below. Prosternum acuminate posteriorly; mesosternal process

broad and truncate, the intermediate coxae distant; metasternal process truncate, not quite meeting the mesosternum. Tarsal formula 4, 4, 5; the anterior and middle pairs with the first three joints short and subequal, the 4th as long as the three preceding together; the posterior pair with the first four joints short and subequal, the 5th as long as the three preceding together. Elytra distinctly sinuate.

The species on which this genus is founded has the facies of a *Gyrophaena*, but differs as above indicated by the constricted inner border of the 1st joint of the labial palpi, the very strongly toothed inner lobe of the maxilla, and the shorter 1st joint of the posterior tarsi. The genus appears to connect *Gyrophaena* with *Pseudosilusa*.

95. **Pseudophaena castanea**, n. sp.

Rufo-castaneous, shining; the elytra strongly punctured; first three joints of the antennae, mouth-parts and legs reddish-testaceous, the anterior tibiae and apex of intermediate and posterior tibia pitchy. Length 1·8 mm.

Head large, transverse, the eyes large and moderately prominent; temples strongly narrowed posteriorly; puncturation very sparing and superficial. Antennae with the 1st joint rather stout, longer and stouter than the 2nd, the 3rd a little shorter than the 2nd, the 4th moniliform, the 5th to the 10th transverse, gradually increasing in breadth, the penultimate three times as broad as long, the 11th short, stout, bluntly pointed. Thorax three-fourths as broad again as long, widest before the middle, the sides rounded and contracted anteriorly, narrowed in a nearly straight line to the obtuse but distinct posterior angles, the sides and base bordered; the disc with an impressed line in the middle, the base with a transverse row of rather large close punctures, the rest of the surface with a few scattered more or less obsolete punctures, sparingly pubescent. Elytra transverse, broader and a little longer than the thorax, for a small species rather coarsely but not closely punctured, sparingly pubescent. Abdomen very finely and very sparingly punctured, the fifth, sixth and seventh segments with coriaceous ground-sculpture.

Hab. Rotting fruit, Pasir Panjang beach.

96. **Coenonica angusticollis**, n. sp.

Black, moderately shining, the base of the abdomen more or less pitchy; elytra testaceous, infuscate about the scutellum and postero-

external angles; the first three joints of the antennae and the legs testaceous. Length 2·4 mm.

Of the same coloration as *C. puncticollis* Kr., but narrower, the thorax especially being much less widened anteriorly and considerably less shining. Head subpentagonal, the temples convergent posteriorly in a straight line, the eyes large and prominent, the disc foveate in the middle, closely and coarsely punctured, the punctures obscurely umbilicate. Antennae with the 2nd and 3rd joints rather short and subequal, the 4th to the 10th transverse gradually increasing in breadth, the penultimate three times as broad as long, the 11th stout, conical. Thorax slightly transverse, widest at the middle, the sides gently rounded and narrowed anteriorly, more strongly narrowed posteriorly in a nearly straight line to the obtuse posterior angles and furnished with two or three moderately long setae; disc with a horseshoe-shaped impression with concavity forwards; puncturation as on the head. Elytra longer and broader than the thorax, square; puncturation about the same size as that of the thorax, but not so deep and scarcely so close, finely pubescent. Abdomen moderately, finely and moderately closely punctured anteriorly, more sparingly posteriorly, finely pubescent.

♂. Seventh dorsal segment with a small tubercle before the posterior margin in the middle line; eighth dorsal segment with a triangular tooth on either side, separated by a triangular notch from the broadly truncate median portion of the segment.

Hab. In débris, Sembawang.

97. Coenonica stricticollis, n. sp.

Moderately shining, head black, thorax pitchy-red, strongly contracted towards the base, elytra testaceous, abdomen pitchy-testaceous. Length 2 mm.

Head subpentagonal, the eyes large and rather prominent, the temples convergent posteriorly; disc impressed rather broadly, coarsely and closely punctured, the punctures obscurely umbilicate, finely pubescent. Antennae reddish-testaceous, the first three joints paler, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate nearly three times as broad as long, the 11th elongate, oval, pointed as long as the three preceding together. Thorax transverse, one-third broader than long, widest at the middle, the sides rounded and contracted anteriorly, more strongly contracted and sinuate posteriorly to the obtuse and somewhat prominent posterior angles; disc with a horseshoe-shaped impression posteriorly, and another rather deep oval one anteriorly in the

middle line, the sculpture close and granular. Elytra broader than, and about as long as the thorax, transverse, puncturation superficial moderately fine and moderately close. Abdomen rather finely and closely punctured anteriorly, the sixth to the eighth segments much more sparingly, finely pubescent.

♂. Eighth dorsal segment with a sharp, short incurved tooth on either side, the margin between the lateral teeth with four shorter, blunt teeth.

Hab. In débris, Keppel Harbour.

Mimomalota, n. gen.

Maxillary palpi 4-jointed, the 1st joint small, the 2nd moderate, thickened towards the extremity, the 3rd longer than the 2nd, narrowed at the base, the 4th small, subulate, about one-third as long as the preceding. Inner lobe of the maxilla narrow, strongly pectinate; outer lobe ciliate-plumose at apex. Mandibles stout, strongly curved at the extremities, the right one with a tooth, both crenulate towards the apex. Tongue narrowed at the base, widened towards the apex which is bifid, not extending as far as the apex of the 1st joint of the labial palpi. Paraglossae ciliate extending to the level of the tip of the tongue. Labial palpi 2-jointed, the 1st joint elongate and with two cilia at the inner border, the 2nd narrower about one-half as long as the 1st. Temples convergent posteriorly, bordered below. Prosternum rounded posteriorly without distinct intercoxal process. Mesosternal process narrow, its apex acuminate. Metasternal process acuminate, meeting the preceding at the level of the middle of the coxae. Intermediate coxae very narrowly separated. Tarsal formula 4, 4, 5. Anterior tarsi with the first three joints short, subequal, the 4th joint a little longer than the three preceding together. Middle tarsi with the first three joints short, slightly increasing in length, the 4th quite as long as the three preceding together. Posterior tarsi with the first four joints rather short, subequal, the 5th as long as the two preceding together. Middle and posterior tibiae with a weak seta at the middle of the external margin. Elytra slightly sinuate internal to the postero-external angles.

The genus has the build of *Homalota*, but is readily distinguished by the setae of the tibiae being feeble, the tongue is moreover narrowed at the base, the 1st joint of the labial palpi is not elbowed and the mandibles are finely crenulate towards the apex.

98. **Mimomalota bispina,** n. sp.

Linear, moderately shining, pitchy; thorax and abdomen brown, the fifth and sixth segments of the latter more or less pitchy; elytra fusco-testaceous. Antennae reddish-testaceous; legs testaceous. Length 2 mm.

Head as broad as long; the diameter of the eyes (seen from above) shorter than the temples, which are straight and rather strongly convergent posteriorly; puncturation moderately fine and rather close, the anterior portion of the disc and the front nearly impunctate; ground-sculpture distinct, coriaceous. Antennae with the 2nd joint shorter than the 1st, the 3rd subequal to the 2nd, the 4th slightly, the 5th to the 10th more strongly transverse, gradually increasing in breadth, the 11th conical. Thorax slightly transverse, wider than the head, broadest just before the middle, the sides from thence very slightly rounded but distinctly contracted anteriorly, more strongly contracted and slightly sinuate posteriorly to the obtuse posterior angles; disc rather broadly impressed throughout its length; the posterior border narrowly margined; puncturation much finer than that of the head, but nearly as close; ground-sculpture coriaceous; finely pubescent; the sides with two fine setae, one near the anterior angles, the other about the middle. Elytra a little longer and broader than the thorax, square, feebly emarginate internal to the postero-external angles, very finely, rather closely and obsoletely punctured, very fine pubescent and without visible ground-sculpture. Abdomen parallel, very finely and moderately closely punctured on the first two segments, much more sparingly on the third, the following almost impunctate; ground-sculpture very fine, coriaceous; pubescence very fine.

♂. Eighth dorsal segment deeply excised on either side, so that the lateral margin forms a long incurved spine and the central portion a rounded lobe, not quite extending to the level of the apices of the lateral spines.

♀. Eighth dorsal segment with the posterior margin broadly rounded.

Hab. Woodlands, Mandai, Bukit Panjang, under bark of felled trees.

99. **Mimomalota testacea,** n. sp.

Parallel, shining testaceous, the head and elytra darker. Antennae and legs testaceous. Length 1·2 mm.

A much smaller and more shining species than the preceding and without ground-sculpture. Head reddish-testaceous, shining, as broad as long; the temples longer than the diameter of the eyes and converging posteriorly in a nearly straight line; the disc with a fine longitudinal impressed line; puncturation (for a small species) rather large, not very close, finely and sparingly pubescent and without trace of ground-sculpture. Antennæ with the 3rd joint smaller and distinctly shorter than the 2nd, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate two and a half times as broad as long. Thorax testaceous-yellow, scarcely transverse, but little wider than the head, broadest just behind the anterior angles, the sides rounded and contracted anteriorly, more strongly narrowed posteriorly in a nearly straight line to the rounded posterior angles, the disc with distinct transverse impression before the scutellum and sometimes with a further longitudinal one in front of this; puncturation very fine, not very close, finely and sparingly pubescent; the sides with three fine setæ, one at the anterior angles, one at the middle and one intermediate. Elytra a little longer and broader than the thorax, scarcely longer than broad, fusco-testaceous, puncturation very fine and rather more close than that of the thorax, very finely pubescent. Abdomen parallel, the seventh segment much longer than the sixth, the first four visible segments very finely and sparingly punctured, the seventh and eighth nearly impunctate; pubescence fine and sparing; no visible ground-sculpture.

Hab. Mandai, under bark. Two specimens, both of which are probably females, the eighth dorsal segment being broadly rounded.

Neomalota, n. gen.

Labrum transverse, the sides and angles rounded, the anterior margin lightly emarginate. Mandibles moderate, lightly curved, the right with a small tooth about the middle of the inner border. Maxillary palpi with the 1st joint small, scarcely longer than broad, the 2nd elongate, widened towards the apex, the 3rd longer than the 2nd, the 4th small, subulate not half the length of the preceding. Inner lobe of the maxilla pectinate, the teeth decreasing in length towards the apex; outer lobe ciliate. Mentum transverse, narrower in front than behind, the anterior border broadly and rather deeply emarginate. The tongue narrow and elongate, extending beyond the base of the 2nd joint of the labial palpi, bifid at the extremity. Paraglossæ ciliate extending to the level of the tip of the tongue. Labial palpi 2-jointed, the 1st joint elongate, lightly curved, slightly

constricted at the inner border beyond the middle, the 2nd joint narrower and a little shorter than the 1st. The temples not bordered below. Prosternum lightly produced backwards in a short triangular process in the middle. Mesosternal process bluntly pointed extending half the length of the coxae, which are narrowly separated. Metasternal process not quite meeting the mesosternal process. Anterior tarsi with the first three joints short subequal, the 4th longer than these together. Middle tarsi with the first three joints short but slightly increasing in length, the 4th joint longer than the preceding together. Posterior tarsi with the first four joints rather short but gradually increasing in length, the 5th nearly as long as the preceding together. Middle and posterior tibiae with a short weak seta at the middle of the external border. The elytra sinuate internal to the postero-external angles.

The genus has much of the facies of *Homalota*, but the abdomen is less parallel, the thorax and humeral angles of the elytra are without setae and the posterior and middle tibiae are without evident setae, but these can be detected as mentioned above in a microscopical preparation.

100. **Neomalota cingulata,** n. sp.

Scarcely shining; the head, elytra, and the sixth abdominal segments black or pitchy; the rest of the latter and the antennae reddish-testaceous. Legs testaceous. Length 2 mm.

Head black (sometimes reddish-brown like the thorax), transverse, the temples strongly rounded and contracted passing insensibly into the base; the eyes rather large and prominent; puncturation fine, very close and rugose. The antennae rather long, the 1st joint longer than the 2nd, the 2nd a little shorter than the 3rd, the 4th and 5th square, the 6th to the 10th slightly transverse, the 11th as long as the two preceding together. Thorax reddish-brown, slightly transverse, widest at the middle, the sides rounded and narrowed anteriorly, more strongly narrowed posteriorly in a nearly straight line to the obtuse posterior angles; the disc grooved in the middle line throughout the whole length; puncturation close, fine and rugose as on the head, very finely pubescent. Scutellum triangular, rugose. Elytra scarcely longer, but broader than the thorax, slightly transverse and less dull than the fore-parts, blackish, sometimes a little rufescent at the extreme base; sculpture consisting of a number of moderately large irregular-scattered punctures on the disc and towards the sides a close rugose puncturation similar to that of the thorax, ground-sculpture very finely coriaceous. Abdomen very finely and rather closely punctured and pubescent throughout,

The 3rd to the 5th abdominal segments transversely impressed at the base. There appear to be no secondary sexual characters.

Hab. Bukit Timah and Mandai, in débris; I believe associated with Ants.

Lampromalota, n. gen.

Mandibles short and robust, the right with a small tooth. Maxillary palpi 4-jointed, the 1st joint short, the 2nd elongate, lightly curved and thickened towards the apex, the 3rd a little longer than the 2nd, the 4th subulate, nearly half as long as the preceding. The temples bordered below. Prosternal process obtuse. Mesosternal process obtuse, rounded at the apex. Metasternal process broadly rounded, not nearly meeting the preceding. Coxae narrowly separated. Tarsal formula 4, 4, 5. The anterior with the first three joints short and subequal, the 4th nearly as long as the first three together; the middle with the first three joints short and subequal, the 4th as long as the three preceding together; the posterior with the first four joints short and subequal, the 5th as long as the three preceding together. The tibiae without setae.

This genus has the build of *Homalota*, from which it is distinguished by the shining, obsoletely punctured head and thorax, and the absence of setae on the middle and posterior tibiae. The specimen being unique I am unable to give further details of the structure of the mouth-parts.

101. **Lampromalota brunneicollis**, n. sp.

Sub-parallel, depressed, shining. Head black; thorax pitchy-brown; elytra and abdomen and first three joints of the antennae fusco-testaceous; legs testaceous. Length 1·8 mm.

Head large, black, shining, transversely suborbicular, the front truncate, eyes rather large, temples rounded and converging, slightly constricted behind; puncturation exceedingly fine and sparing and without visible ground-sculpture. Antennae with the first three joints fusco-testaceous, the others black; the 2nd joint shorter than the 1st, the 3rd shorter than the 2nd, the 4th as broad as long, the 5th to the 10th transverse, gradually increasing in breadth, the penultimate fully twice as broad as long, the 11th oval. Thorax transverse, a little broader than the head, widest just behind the anterior angles; the sides narrowed and rounded anteriorly, more strongly contracted behind in a straight line to the obtuse posterior angles; the base finely bordered; puncturation and pubescence very

fine and sparing; the sides with two setae near the anterior angles. Scutellum finely punctured. Elytra fuseo-testaceous, obscurely darker at the base, parallel, a little longer than, but as wide as, the thorax, scarcely longer than broad, finely and obsoletely but moderately closely punctured and finely pubescent; the sides with a seta behind the humeral angles. Abdomen very slightly widened behind, less shining than the fore-parts, very finely but pretty closely punctured and pubescent throughout, rather more sparingly on the last two segments.

Hab. Bukit Panjang. A single specimen in a decaying log.

102. **Homalota nitescens,** n. sp.

Black, a little shining, elytra and legs testaceous; the first two joints of the antennae reddish-testaceous. Length 2 mm.

Of the size and build of *H. tuberculicollis* Kr., of Ceylon, but distinctly more shining and with the elytra of a clearer testaceous; the ground-sculpture of the head and thorax is less marked so that the puncturation is more defined, otherwise there is but little difference between the species. Head black, closely and finely punctured, ground-sculpture fine, coriaceous: finely pubescent. Antennae with the 2nd joint shorter than the 3rd, the 4th transverse, smaller than the following, the 5th to the 10th transverse, gradually increasing in breadth, the 11th conical. Thorax as in *tuberculicollis*, but more shining, puncturation very fine and close; ground-sculpture fine and coriaceous; disc obsoletely impressed along the middle. Elytra square, a little broader than the thorax, scarcely infuscate at the scutellum and the postero-external angles, very finely punctured and pubescent. Abdomen very finely and closely punctured and pubescent throughout.

♂. Unknown.

Hab. District not noted. A single specimen apparently a ♀ taken in rotting fruit.

103. **Homalota bidens,** n. sp.

Black, subopaque, the thorax reddish-brown, the seventh and eighth abdominal segments reddish; the first two joints of the antennae and legs testaceous. Length 1·4 mm.

Head closely and finely punctured, coriaceous with a short longitudinal impression on the vertex. Antennae rather short and stout, the 2nd and 3rd joints of equal length, the 4th to the 10th transverse gradually increasing in breadth, the penultimate more than twice as broad as long, the 11th conical. Thorax transverse, broader than

the head, the sides rounded and narrowed before the middle anteriorly, narrowed in a nearly straight line to the obtuse posterior angles, the disc rather broadly impressed throughout in the middle; closely and finely punctured and pubescent, coriaceous. Elytra square, a little longer and broader than the thorax, very finely and closely punctured and pubescent. Abdomen closely and finely punctured and pubescent in front, much more sparingly on the sixth, seventh and eighth segments.

♂. Posterior margin of the eighth abdominal segment with a semicircular excision on either side bounded externally by a sharp inwardly directed spine; the margin between the excisions crenulate.

Hab. Mandai, in rotting fruit.

104. **Homalota cingulata,** n. sp.

Black, scarcely shining; the thorax reddish-brown; the abdomen (with the exception of the sixth segment) dark reddish-testaceous. First two joints of the antennae and legs testaceous. Length 1·5 mm.

Head transverse, quadrate, narrowed behind the eyes, finely and closely punctured except on the front, which is impressed, ground-sculpture fine and coriaceous. Antennae stout, the 2nd joint longer than the 3rd, the 4th to the 10th transverse and gradually increasing in breadth, the penultimate joints about two and a half times broader than long, the 11th rather long, conical. Thorax transverse broadest about the middle, gradually rounded and narrowed anteriorly, more strongly narrowed and very slightly sinuate to the posterior angles, which are obtuse and form a minute blunt tooth; the base very indistinctly sinuate on either side, not at all produced in front of the scutellum; the disc broadly impressed in the middle throughout its length, very closely and finely punctured and pubescent, finely coriaceous; anterior angles and middle of the sides with a seta. Elytra one-third longer and a little broader than the thorax, square, very finely and closely punctured and pubescent. Abdomen very finely and very sparingly punctured and pubescent.

♂ (?). Sixth ventral segment a little produced, narrowed and rounded at the extremity.

Hab. District not noted; in rotting fruit.

105. **Homalota fuscipennis,** n. sp.

Black scarcely shining, the thorax opaque, the elytra pitchy-black; antennae rather long, fuscous; legs testaceous. Length 2 mm.

Head obsoletely foveolate on the disc, very finely and closely

punctured except in front which is nearly impunctate and slightly more shining, very finely coriaceous. Antennae with the 2nd and 3rd joints of equal length, the 4th to the 7th longer than broad gradually decreasing in length, the 8th to the 10th scarcely transverse, the 11th longer than the two preceding together, pointed. Thorax a little transverse, widest just before the middle, the sides slightly rounded and narrowed anteriorly, more strongly narrowed in an almost straight line to the obtuse posterior angles, the base truncate in the middle, the disc impressed in the middle line throughout; sculpture densely coriaceous, definite puncturation being scarcely discernible; the anterior angles and middle of the sides with a seta. Elytra a little longer and broader than the thorax; square very finely and thickly punctured, finely pubescent, humeral angles with a seta.

Abdomen finely and rather closely punctured, more sparingly on the sixth, seventh and eighth segments, the sides and apex setose.

♂ (?). Sixth ventral segment a little produced, narrowed and rounded.

♀ (?). Eighth dorsal segment truncate its apical margin with short stiff yellow setae.

Hab. Mandai and Botanical Gardens, in rotting fruit.

106. **Homalota serrata**, n. sp.

Head black; thorax reddish-brown; elytra and legs testaceous; abdomen (except the sixth segment which is blackish) and the antennae reddish-testaceous. Length 2 mm.

A larger, broader and more depressed species than *H. variventris* Kr., with more broadly impressed thorax and more sparingly punctured abdomen and different ♂ characters. Head black, scarcely shining, very finely and closely punctured, finely and densely coriaceous, finely pubescent. Antennae stouter than in *variventris*, the 2nd and 3rd joints of equal length, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate joints nearly twice as broad as long, the 11th conical, longer than the two preceding together. Thorax transverse widest just before the middle, the sides rounded and narrowed anteriorly, more strongly contracted in a nearly straight line to the obtuse posterior angles; the base a little produced backwards in the middle, the border here being a little raised; the disc broadly impressed throughout; puncturation very fine and close, ground-sculpture coriaceous, pubescence fine. Elytra a little longer and broader than the thorax, square, more shining than the fore-parts, yellow-testaceous, obscurely infuscate about the postero-external angles, very finely and closely punctured

and pubescent. Abdomen finely and pretty closely punctured and pubescent throughout; but rather more sparingly on the two last segments.

♂. Eighth dorsal segment with a feeble emargination on either side bounded externally by a small tooth, the border between the emarginations finely serrate.

Hab. District not noted; in rotting fruit. A single ♂.

107. **Homalota denticulata,** n. sp.

This species differs only from the preceding by its larger (length 2·4 mm.) and more robust build, coarser sculpture of the fore-parts and the ♂ characters.

♂. Eighth dorsal segment emarginate on either side, the emargination bounded externally by a rather long sharp tooth, the posterior border between the emarginations with eight sharp teeth.

Hab. Mandai and Woodlands, in rotting fruit.

108. **Thectura brunneicollis,** n. sp.

Rather shining; the head black, the thorax pitchy-brown, the elytra and fifth and sixth abdominal segments pitchy, the rest of the latter reddish-testaceous. Legs testaceous. Length 1·6 mm.

A narrow, elongate, parallel, depressed and somewhat shining species, the head black, quadrate, scarcely transverse, the eyes moderate in size, the temples very slightly dilated; vertex with a narrow longitudinal impunctate impression, the front smooth, the rest of the surface with (for a small species), moderately large and moderately close puncturation; ground-sculpture coriaceous, but very fine and obsolete; pubescence very fine. Antennae blackish, the first two joints obscure testaceous, the 2nd joint shorter than the 1st, the 3rd shorter and smaller than the 2nd, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate quite three times as broad as long, the 11th short, conical; mouth-parts obscure testaceous. Thorax a little transverse, scarcely broader than the head, the sides scarcely rounded anteriorly, contracted slightly in a nearly straight line to the rounded posterior angles; the disc impressed throughout its length in the middle line and with a transverse impression before the scutellum; puncturation and pubescence very fine and sparing; ground-sculpture very fine and obsolete, coriaceous. The elytra pitchy, as broad as, but slightly longer than, the thorax and very finely but more closely punctured, very finely pubescent. Abdomen exceedingly finely and sparingly punctured and pubescent, almost glabrous posteriorly.

♂. Eighth dorsal segment with the posterior border deeply emarginate on either side, the emargination bounded externally by a sharp slightly incurved spine and with a sharp, short triangular tooth on either side of the middle line separated by a small notch; the extremities of both the teeth and spines being on the same level.

Hab. Mandai, in rotten fungus.

109. **Heterota arenaria**, n. sp.

Black, with greasy lustre, the elytra with an indeterminate orange spot occupying the sutural region towards the apex. Antennae, mouth-parts and legs reddish-testaceous. Length 2 mm.

Extremely similar to *Alianta* (*Heterota*) *pictipennis** Fauv., the only differences being that the coriaceous sculpture at the bases of the abdominal segments is much coarser, the puncturation of the sixth and seventh segments is less fine and more asperate and the orange spot on the elytra is more diffuse and tends to spread towards the humeral angles, and the palpi are reddish-testaceous in the present species. Head transverse, the eyes rather large but not prominent, the temples convergent and but little rounded posteriorly, very finely and moderately closely punctured, densely and finely coriaceous, with very fine greyish pubescence. Antennae with the 1st joint shorter than the 2nd, the 3rd longer than the preceding, the 4th and 5th a little longer than broad, the 6th as long as broad, the 7th to the 10th transverse gradually increasing in breadth, the 11th fully as long as the two preceding together, conical. Thorax slightly transverse, widest about the middle, from thence the sides rounded and contracted anteriorly, more strongly contracted in a nearly straight line to the obtuse posterior angles; the base obscurely bifoveolate before the scutellum, the disc in the middle rather broadly impressed throughout nearly the whole length, but less broadly in front; puncturation, ground-sculpture and pubescence similar to that of the head. Scutellum triangular, densely coriaceous, the margins towards the apex shining. Elytra longer and broader than the thorax, as long as broad, scarcely punctured, densely and finely coriaceous, with a finely granular appearance; pubescence as on the thorax. Abdomen more shining than the fore-parts, the bases of the segments densely and rather coarsely coriaceous, the third, fourth and fifth segments with a transverse row of fine asperate punctures at the apices, the sixth, seventh and eighth segments finely, asperately and sparingly punctured.

Hab. Seaweed on sandy beach at Changi.

* As pointed out by me in Ent. Mo. Mag., vol. liv, 1918, p. 183, this insect belongs to the genus *Heterota*.

MYRMEDONIINI.

110. **Falagria tenuicornis**, n. sp.

Pitchy-brown, dull, the first two joints of the antennae, the base of the elytra, 1st visible abdominal segment, posterior margin of the 2nd and legs yellow-testaceous, the distal half of the intermediate and posterior femora and bases of the corresponding tibiae, a little infuscate. Length 3 mm.

Smaller and much narrower than *F. opacicollis* Kr., with much smaller head, more slender antennae and much less shining elytra and abdomen than in that species and moreover with only the third (first visible) and posterior margin of the second abdominal segment testaceous, which with the elytra are much more closely punctured. Head suborbicular, the temples rounded and passing insensibly into the base, sculpture finely and densely coriaceous without visible puncturation. Antennae slender with all the joints considerably longer than broad, the 2nd about as long as, but more slender than the 1st, the 3rd longer than the 2nd, the 4th to the 10th longer than broad, gradually decreasing in length, the 11th elongate as long as the two preceding together. Thorax one-fourth as long again as the breadth at the widest part, contracted behind, rounded and dilated anteriorly, the disc narrowly sulcate in the middle throughout its length; sculpture as on the head. Scutellum impunctate and without keel. Elytra broader than, but (at the suture) a little shorter than the thorax, not so dull as the fore-parts, very finely and closely punctured, finely pubescent. Abdomen less dull than the thorax, very finely and closely punctured and pubescent throughout.

Hab. Sembawang, on bank of a jungle stream.

111. **Falagria brevicornis**, n. sp.

Reddish-brown, shining; the elytra fusco-testaceous; base of the abdomen, the first four and the last joints of the antennae and the legs testaceous, the intermediate joints of the antennae and the apical half of the intermediate and posterior femora more or less infuscate. Length 2·8 mm.

In build and coloration so similar to *F. dimidiata* Motsch., that an enumeration of the points of difference should suffice. The antennae are stouter and shorter, the 8th joint being as long as broad and the 9th and 10th distinctly transverse, the puncturation of the thorax is distinctly more sparse, the base is more strongly constricted and the posterior angles more prominent; the puncturation of the abdomen is distinctly less close.

Hab. Woodlands and Bukit Timah, in rotten wood; Singapore town at light.

112. **Falagria** (s. str.) **flavipennis,** n. sp.

Black, shining; the elytra testaceous-yellow, the base and scutellary region infuscate; antennae black, legs testaceous. Length 1·75 mm.

About the size and build of *F. pygmaea* Kr., but of different coloration, the antennae entirely dark, longer and more slender, and the thorax a little shorter. Head transversely subquadrate, the temples scarcely dilated, longer than the diameter of the eyes, vertex deeply sulcate in the middle, puncturation fine, obsolete, moderately close. Antennae with the 2nd joint a little shorter than the 1st, the 3rd distinctly shorter than the 2nd, the 4th to the 10th transverse, gradually increasing in breadth, the 11th short, conical. Thorax transverse the sides rounded in front, pretty strongly narrowed towards the base; disc with a small transverse impression before the scutellum and with a deep narrow channel throughout its length in the middle line; puncturation similar to that of the head, pubescence fine and sparing. Elytra scarcely longer but a little broader than the thorax, transverse, very finely and moderately closely punctured, finely and sparingly pubescent. Abdomen pretty closely and finely punctured on the first three visible segments, more sparingly towards apex.

Hab. Botanical Gardens, under bark.

Eusteniamorpha, n. gen.

Labrum transverse, corneous, truncate, the sides and anterior angles rounded. Mandibles short, stout, pointed, the right with a small tooth at the middle of the inner border. Maxillary palpi 4-jointed, the 1st joint small, the 2nd narrow at the base dilated gradually towards the apex, the 3rd as long as the 2nd, but a little thicker towards the extremity, the 4th subulate, about one-third as long as the preceding. Inner lobe of the maxilla narrow, pointed and incurved at the apex, pectinate internally, the teeth increasing in length from before backwards; outer lobe narrow the apex shortly ciliate. Tongue broad, membranous as long as the 1st joint of the labial palpi, the sides and apex rounded. Paraglossae distinct, shortly ciliate, not extending beyond the apex of the tongue. Labial palpi 3-jointed, the 1st joint short (but longer than broad), the 2nd shorter and narrower than the 1st, the 3rd a little longer but narrower than the 2nd. Gular sutures distant, slightly diver-

gent behind. Temples strongly bordered below. Neck broad, the temples constricted behind. Prosternum long, carinate; mesosternal process extending for half the length of the intermediate coxae, truncate, the coxae moderately separated; metasternal process truncate meeting the mesosternum. Elytra not sinuate. Tarsal formula 3, 4, 4; the anterior pair with the first two joints short and subequal, the 3rd longer than the two preceding together; middle pair with the 1st joint moderately long, the 2nd and 3rd short, and subequal, the 4th nearly as long as the three preceding together; posterior pair with the 1st joint moderately long, the 2nd and 3rd subequal, shorter than the 1st, the 4th nearly as long as the three preceding together. Abdomen strongly constricted at the base and dilated posteriorly. The third to the fifth dorsal segments lightly impressed transversely at the bases. Thorax strongly contracted before the base, the sides dilated and rounded anteriorly, the posterior angles rectangular, prominent.

This genus would appear to be closely related to *Eustenia* and *Falagria*, yet is at once separated from both by the structure of the tarsi. The broad neck and build of the temples is very similar to that of *Trogophloeus*, the temples being constricted behind the eyes, but the antennae are freely inserted in front of the eyes, the gular sutures are distinct and widely separated and the structure of the prosternum and anterior coxae indicate the position of the genus as being in the *Alevocharinae*.

113. **Eusteniamorpha rufa**, n. sp.

Rufo-castaneous, moderately shining, the sixth abdominal segment pitch-black. Antennae mouth-parts and legs reddish-testaceous. Length 2 mm.

Eyes moderate, rather prominent, their diameter of the length of the temples, which are convergent posteriorly and but slightly rounded, the neck broad; the front smooth and shining, the posterior and lateral portions finely, superficially and rather closely punctured; pubescence fine, scanty and yellow. Antennae with the 1st joint a little shorter and stouter than the 2nd, the 3rd a little shorter than the preceding, the 4th to the 6th longer than broad, gradually decreasing in length, the 7th to the 9th as long as broad, the 10th very slightly transverse, the 11th elongate pointed, as long as the two preceding together. Thorax broader than the head, as long as the breadth at the widest part, strongly constricted at the base, the sides much dilated and rounded anteriorly, the disc sulcate throughout nearly the whole length in the middle, the sulcus wider

posteriorly; puncturation fine, superficial and close: pubescence yellow and fine. Scutellum triangular, impunctate, with a keel on either side converging to the apex. Elytra ample, rather convex, broader, but a little shorter at the suture than the thorax, the sides lightly rounded, the posterior borders broadly emarginate; sculpture consisting of scattered, superficial and rather fine punctures, between which a few exceedingly fine points are sparingly distributed; pubescence fine, yellow. Abdomen strongly contracted at the base, enlarged posteriorly, very finely and pretty closely punctured and pubescent throughout.

Hab. Bukit Timah, Sembawang, in débris, etc., associated with a species of *Pheidole*.

114. **Atheta (Glossola) moultoni**, n. sp.

Reddish-testaceous, moderately shining, the head darker, the elytra broadly infuscate on the disc and sides leaving the base and apical margin more or less testaceous; abdomen with the fifth, sixth and greater part of the seventh dorsal segments, black. Antennae with the first three and the last joints testaceous, the intermediate ferruginous; mouth-parts and legs testaceous. Length 2·8 mm.

Head ferruginous, transversely orbicular, the eyes rather large and moderately prominent, the temples convergent and rounded to the base; finely and closely punctured and pubescent. Antennae moderate, the first three joints subequal, the 4th to the 7th longer than broad, gradually decreasing in length, the 8th and 9th about as long as broad, the 10th slightly transverse, 11th elongate oval, acuminate, as long as the two preceding together. Thorax slightly transverse, widest at the junction of the first and second thirds, the sides from thence rounded and narrowed anteriorly, more strongly narrowed and slightly sinuate behind to the obtuse posterior angles; base with a small impression in front of the scutellum, disc with fine median line throughout; puncturation fine and close, finely pubescent. Scutellum triangular, closely and finely punctured. Elytra as long as, but broader than the thorax, slightly transverse, finely and closely punctured and pubescent, the posterior margin not sinuate at the postero-external angle. Abdomen finely and moderately closely punctured and pubescent throughout, the sides and apex with a few black setae.

♂. Sixth ventral segment narrowed, produced and rounded at the extremity.

This species would appear to be properly placed near

A. gregaria Er., which it resembles in the build of the thorax and the structure of the posterior tarsi.

Hab. Keppel Harbour and Bukit Timah, in débris.

115. Atheta (Metaxya) alophila, n. sp.

Black, moderately shining, the elytra brown; first two joints of the antennae and legs fusco-testaceous. Length 2–2·5 mm.

Of exactly the coloration and greasy shining lustre and build of *A. meridionalis* Rey, of Europe, but a little more robust, the antennae a little longer and distinctly more slender, the elytra a little shorter and the abdomen rather more finely punctured. Head rather large suborbicular with distinct median longitudinal impression anteriorly; finely and not very closely punctured, finely pubescent, with fine coriaceous ground-sculpture; eyes rather large, not prominent. Antennae long and slender, the first three joints elongate, sub-equal, the 4th distinctly, the 5th to the 7th joints slightly longer than broad, the 8th to the 10th scarcely transverse, the 11th elongate pointed, as long as the two preceding together. Thorax transverse, of similar build to that of *A. meridionalis*, the base before the scutellum with a small transverse impression, the disc with fine longitudinal impression; finely and not very closely punctured, finely pubescent; ground-sculpture fine and coriaceous. Elytra a little longer and distinctly broader than the thorax, transverse, with puncturation, ground-sculpture and pubescence much as on the fore-parts. Abdomen very finely but not closely punctured and pubescent, more sparingly on the last two segments.

♂. Eighth dorsal segment truncate; sixth ventral segment a little narrower and more produced than in the ♀.

♀. Eighth dorsal segment feebly emarginate posteriorly.

Hab. Pasir Panjang, in seaweed.

116. Atheta (Dralica) picea, n. sp.

Pitchy, greasy-shining, the head and fifth, sixth and seventh abdominal segments blackish. First two joints of the antennae, mouth-parts and legs, testaceous. Length 1·4 mm.

Head transverse, the temples very slightly dilated, the eyes moderate, their diameter less than the length of the temples, exceedingly finely and rather closely punctured and finely pubescent. Antennae moderately long and stout, the first two joints subequal, the 3rd shorter than the 2nd, the 4th to the 10th transverse, gradually increasing in width, the penultimate two and a half times as

broad as long, the 11th stout more than double the length of the two preceding together, rounded at the apex. Thorax a little transverse and of the shape of that of *Meotica indocilis* Heer, exceedingly finely and closely punctured and pubescent. Elytra scarcely longer, but a little broader than the thorax, slightly transverse, exceedingly finely and closely punctured and pubescent, not sinuated. Abdomen parallel, exceedingly finely and moderately closely punctured and pubescent, less so on the seventh segment.

This small distinctly pubescent species appears to be properly placed in proximity to *vilis* Er.

Hab. Woodlands, in rotten wood.

117. **Atheta (Microdota) melata,** n. sp.

Sub-depressed, parallel, black, shining; elytra pitchy; legs fusco-testaceous. Length 1·75 mm.

Of the build and general appearance of *A. puberula* Shp., but with the elytra shorter. Head rather large, transversely quadrate, the eyes rather large, the temples rounded posteriorly, the vertex impressed; puncturation and pubescence exceedingly fine and not very close; ground-sculpture scarcely visible, coriaceous. Antennae with the 1st and 2nd joints subequal, the 3rd shorter than the 2nd, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate about one-half as broad again as long; the 11th oval, pointed, as long as the two preceding joints together. Thorax as in *puberula*, but less transverse, one-fourth as broad again as long, with puncturation and pubescence much as on the head. Elytra scarcely longer, but a little broader than the thorax, square, exceedingly finely and not closely punctured and pubescent. Abdomen with the first six segments exceedingly finely and sparingly punctured, the seventh and eighth still more sparingly.

♂. Head impressed on the disc. Eighth dorsal segment with a broad and deep semicircular emargination of the posterior border.

Hab. District not noted; in dung. A single ♂.

118. **Atheta (Microdota) malayana,** n. sp.

Shining; head black, thorax and base and apex of the abdomen pitchy-brown, elytra fusco-testaceous; first two joints of the antennae and legs testaceous. Length 1·3 mm.

Head transversely quadrate, the temples rounded, eyes moderate, not prominent; exceedingly finely and sparingly punctured, finely pubescent; disc (in the ♂) with a small impression. Antennae with the first two joints subequal, the 3rd shorter than the 2nd,

the 4th scarcely as broad as long, the 5th to the 10th transverse, gradually increasing in breadth, the penultimate about half as broad again as long, the 11th oval, pointed, about as long as the two preceding together. Thorax transverse, half as broad again as long, the sides slightly rounded and contracted posteriorly, exceedingly finely but rather more closely punctured than the head, finely pubescent; disc not impressed. Elytra a little longer and a little broader than the thorax, slightly transverse, exceedingly finely and about as closely punctured as the thorax, finely pubescent. Abdomen very finely but not closely punctured and pubescent throughout, a little more sparingly on the seventh and eighth segments. Intermediate tibiae with a fine seta.

♂. Head with a small impression on the disc. Eighth dorsal segment truncate; sixth ventral segment produced, narrowed and rounded at the apex.

Hab. Mandai and Woodlands, in fungus, rotten wood and fruit.

119. **Atheta (Microdota) vulgaris,** n. sp.

Black, shining, elytra fusco-testaceous; first two joints of the antennae pitchy. Legs testaceous. Length 1·3 mm.

Very similar to *A. malayana* in coloration and size, the thorax is, however, narrower and the puncturation is much more distinct on the fore-parts; that of the sixth, seventh and eighth segments of the abdomen much more sparing and the antennae are a little longer, the intermediate tibiae are furnished with a distinct, black seta near the middle, which in *A. malayana* is very feebly represented. Its position would appear to be near *A. inquinula* Gr. Head suborbicular, very finely but distinctly, and moderately closely punctured, finely pubescent. Antennae with the first two joints subequal, the 3rd shorter than the 2nd, the 4th as long as broad, the 5th to the 10th transverse gradually increasing in width, the penultimate about half as broad again as long. Thorax transverse, about one-third as broad again as long, the sides narrowed posteriorly, disc with a fine longitudinal channel in the middle, puncturation and pubescence very similar to that of the head. Elytra scarcely longer but distinctly broader than the thorax, transverse, with puncturation and pubescence as on the fore-parts. Abdomen very finely and sparingly punctured anteriorly, the sixth, seventh and eighth segments nearly impunctate. Intermediate tibiae with distinct black seta about the middle.

♂. Eighth dorsal segment truncate, sixth ventral segment a little produced, narrowed and rounded.

♀. Eighth dorsal segment very feebly emarginate posteriorly.

Hab. Generally distributed in dung and rotting fruit.

120. **Atheta (Microdota) purpurascens,** n. sp.

Black, shining with slight bronze-copper metallic reflex. Antennae with the first two joints pitchy-testaceous; legs pale testaceous. Length 1·3 mm.

A small shining species of exactly the build of *A. atomaria* Kr., with a slight somewhat purplish-bronze reflex and pale legs. Head quadrate, the temples broadly rounded, the eyes rather large but not prominent; puncturation and pubescence exceedingly fine and sparing; ground-sculpture exceedingly fine, coriaceous, scarcely visible. Antennae with the 3rd joint shorter than the 2nd, the 4th to the 10th transverse, the penultimate joints more than twice as broad as long, the 11th conical quite as long as the two preceding together. Thorax pitchy, about one-third broader than long, with puncturation, pubescence and ground-sculpture as on the head. Elytra one-third longer, and a little broader than the thorax, slightly transverse, exceedingly finely and rather closely punctured and pubescent. Abdomen very finely and sparingly punctured and pubescent, especially posteriorly.

Hab. Bukit Timah.

121. **Atheta** (s. str.) **miriventris,** n. sp.

Bright reddish-testaceous, the elytra obscure testaceous infuscate towards the postero-external angles; abdomen with a black transverse band before the apex; first two joints of the antennae and base of the 3rd, mouth-parts and legs testaceous. Length 2·5–3·5 mm.

♀. Head transverse, reddish-testaceous not very shining (greasy lustre only), the eyes large, moderately prominent, their diameter considerably greater than the length of the temples which are rounded and narrowed posteriorly; the centre of the disc impunctate, the rest of the surface very finely and not closely punctured and pubescent; ground-sculpture fine and coriaceous. Antennae with the 2nd and 3rd joints of equal length, the 4th to the 7th scarcely longer than broad, the 8th to the 10th transverse gradually increasing in width, the 11th elongate, pointed, longer than the two preceding together. Thorax transverse, more than half as broad again as long, widest a little behind the anterior angles, the sides bordered, rounded and narrowed anteriorly, more strongly contracted posteriorly to the obtuse posterior angles; puncturation

and pubescence very similar to that of the head, but not quite so fine; ground-sculpture as on the head; each side with two distinct setae. Elytra a little longer and wider than the thorax, transverse, very finely, rather closely and somewhat asperately punctured, finely pubescent. Abdomen more shining than the fore-parts, bright reddish-testaceous, the fifth, sixth and anterior part of the seventh segments, black glabrous and exeept for a few setiferous punctures, impunctate. Middle and posterior tibiae each with three setae of which the middle is the strongest.

♂. Head anteriorly with a small crateriform tubercle, from which arises a seta. Antennae a little longer than in the ♀. Thorax with a small fovea before the scutellum, the disc with a fine longitudinal groove throughout. Elytra with the postero-external angle usually furnished with a keel. Abdomen with the sixth abdominal segment only black; the third to the sixth dorsal segments elevated in the middle line, appearing tectiform on transverse section; the third segment with a small semicircular emargination in the middle of the posterior border; the fourth with a stout triangular tubercle at the base, the fifth with a broad triangular process arising from the base, the apex pointed and extending backwards for about a third of the length of the segment; * the sixth with the posterior margin produced backwards in the middle line as a pointed tooth reaching the level of the middle of the seventh segment; the eighth narrowed posteriorly, the posterior margin produced backwards in the middle line as a short blunt tooth; first ventral segment embracing the sides of the third dorsal, its upper free edge bluntly pointed posteriorly. Viewed from above it appears as a lamina springing from the second dorsal segment and extending parallel to the third, its true relations are however revealed on dissection.

The ♀ of this species has quite the facies of *A. crassicornis* F. The ♂ characters are reminiscent of *Myrmedonia*. The structure of the mouth-parts is that of *Atheta*, with the exception that the 4th joint of the maxillary palpi is more than half the length of the 3rd.

Hab. Labrador Villa, in rotting fruit.

122. **Atheta (Dimetrota) carpophila,** n. sp.

Black, greasy-lustrous; the thorax pitchy-red; the second, third, fourth, posterior portion of the seventh and whole of the eighth

* The development of these processes on the fourth and fifth segments is very variable and they are rudimentary in specimens in which the postero-external angle of the elytra is simple.

abdominal segments, bright reddish-testaceous: antennae reddish, the first two joints and the legs, testaceous. Length 2·5 mm.

Very similar in build to *A. mycetophaga* mihi, but more brightly coloured, less shining and with differently formed antennae. Head transverse, the temples small and rounded, the eyes large but not prominent, very finely and sparingly punctured and pubescent. Antennae with the 2nd joint a little shorter than the 3rd, the 4th as broad as long, the 5th to the 10th transverse gradually increasing in breadth, the 11th longer than the two preceding together. Thorax transverse, about half as broad again as long formed as in *mycetophaga*, very finely and closely punctured, finely pubescent; the sides each with two rather fine setae. Elytra a little longer and broader than the thorax, transverse, very finely, closely and more distinctly punctured than the thorax, finely pubescent. Abdomen distinctly narrowed posteriorly, very finely and moderately closely punctured and pubescent anteriorly, the seventh and eighth segments nearly impunctate; the sides sparingly setiferous, the apex more closely. Middle and posterior tibiae each with two distinct setae.

Although the setae of the thorax and middle tibiae are finer than those usually present in the sub-genus *Dimetrota*, yet owing to the distinctly narrowed abdomen and the build of the thorax, it would appear that this species has its closest affinity with this group.

Hab. Bukit Panjang, in rotting fruit.

123. Atheta (Dimetrota) xylophila, n. sp.

Black moderately shining, the elytra pitch-brown; first three joints of the antennae and the legs testaceous. Length 2·4 mm.

Build of *A. cadaverina* Bris., but smaller, differently coloured, the eyes much larger and the elytra shorter. Head broad, the eyes very large, their diameter much greater than the length of the temples, very finely and moderately closely punctured, finely coriaceous. Antennae with the 2nd and 3rd joints of equal length, the 4th small, transverse, the 5th larger than the preceding, scarcely transverse, the 6th to the 10th transverse, gradually increasing in breadth, the penultimate fully twice as broad as long, the 11th longer than the two preceding together. Thorax transverse, fully half as broad again as long, very finely and rather closely punctured, finely pubescent, rather more shining than the head and with similar ground-sculpture; the sides with well developed setae. Elytra scarcely longer, but a little broader than the thorax, transverse, not sinuate posteriorly, the humeral angles with a seta; punctura-

tion very fine, close and asperate. Abdomen but little narrowed posteriorly, the anterior segments very finely and not closely punctured, the seventh segment almost impunctate; the sides and apex setiferous. Middle tibiae with three setae of which the middle one is much longer and stronger; posterior tibiae with two rather fine setae.

♂. Eighth dorsal segment truncate, on either side with a short stout tooth, the margin between the teeth very finely crenulate.

Hab. Woodlands, under bark.

124. **Atheta (Dimetrota) mycetophaga,** n. sp.

Pitch-brown, moderately shining, the head and sixth abdominal segment black; the first two joints of the antennae and the mouth-parts pitchy-testaceous; legs testaceous. Length 1·8 mm.

Build of *Atheta parvula* Mannh., but of different coloration and antennal structure. Head transverse and broader than in *parvula*, the eyes much larger, the temples short, very finely and rather closely, asperately punctured, finely pubescent. Antennae with the 2nd joint a little shorter than the 1st and 3rd which are equal, the 4th scarcely longer than broad, the 5th, 6th and 7th longer than broad, gradually decreasing in length, the 8th to the 10th scarcely longer than broad, the 11th elongate, pointed as long as the two preceding together. Thorax transverse about half as broad again as long, the sides each with three distinct setae, the disc with a small impression before the scutellum, very finely, closely and somewhat asperately punctured, finely pubescent. Elytra a little longer and broader than the thorax transverse, the humeral angles with a seta, the puncturation and pubescence as on the thorax. Abdomen slightly narrowed posteriorly, very finely but not closely punctured anteriorly, more sparingly posteriorly, sides and apex setiferous. Middle and posterior tibiae each with two rather long setae, one (the shorter) below the knee, the other nearer the middle. Sexual differences unknown.

Hab. Mandai, in rotting fungus.

125. **Atheta (Datomicra) onthophila,** n. sp.

Minute, black, shining, elytra brown; the fore-parts closely distinctly and asperately punctured. Legs testaceous. Length 1·2 mm.

Head transverse, the eyes rather small, their diameter considerably less than the length of the temples; puncturation asperate,

fine, distinct and close. Antennae entirely dark, the 3rd joint distinctly shorter than the 2nd, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate nearly twice as broad as long, the 11th as long as the two preceding together. Thorax one-third as broad again as long, the sides with two or three distinct setae, closely, asperately and for a small species rather coarsely punctured. Elytra as long as, but a little broader than the thorax, transverse and similarly punctured. Abdomen distinctly narrowed posteriorly, finely and pretty closely punctured and pubescent throughout, but rather more sparingly behind; sides and apex setiferous. Middle tibiae with two long setae, posterior tibiae with a single long seta.

In build somewhat resembling *A. canescens* Shp., but much more shining, puncturation coarser, thorax narrower and penultimate joints of the antennae more transverse.

Hab. District not noted; in dung.

126. **Atheta (Datomicra) mycetophila**, n. sp.

Pitchy, rather shining, the thorax and more or less of the base of the elytra pitchy-red; the abdomen reddish-testaceous, the sixth segment pitchy; first two joints of the antennae, mouth-parts and legs, testaceous. Length 1 mm.

Head pitchy-black, transverse, exceedingly finely and rather closely punctured; the eyes large, their diameter much greater than the length of the temples. Antennae with the 3rd joint shorter than the 2nd, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate about twice as broad as long, the 11th elongate gradually pointed. Thorax rather shining pitchy-red, about half as broad again as long, the posterior angles rounded; disc with an obsolete longitudinal impression before the scutellum, each side with two distinct setae; puncturation exceedingly fine and close; pubescence fine. Elytra pitchy-black, obscurely reddish towards the base, scarcely longer, but a little broader than the thorax, transverse, exceedingly finely, closely and rather asperately punctured, finely pubescent; posterior border not sinuate. Abdomen distinctly narrowed posteriorly, very finely and sparingly punctured, the seventh and eighth segments nearly impunctate; sides and apex setiferous. Middle tibiae with two distinct setae, posterior with a rather weak seta. Facies somewhat of a minute *canula* Er.

Hab. Sembawang, in rotting fungus.

127. Atheta (Colpodota) ruparia, n. sp.

Pitchy, greasy-lustrous; the head black; elytra testaceous infuscate about the scutellum; first two joints of the antennae and the mouth-parts fusco-testaceous, penultimate joints of the former as long as broad; legs testaceous, the intermediate and posterior tibiae each with two strong setae. Length 2·3–2·5 mm.

Build of *A. pygmaea* Grav., but more brightly coloured, the thorax narrower and the abdomen much more finely and thickly punctured. From *A. peregrina* Kr., it differs by the longer penultimate joints of the antennae, and the thickly pubescent, sericeous abdomen. Head transverse, black, finely and moderately closely punctured, finely pubescent. Antennae moderately long, the 2nd joint a little shorter than the 3rd, the 4th as long as broad, the 5th to the 7th a little longer than broad, gradually decreasing in length, the 8th to the 10th as long as broad, the 11th oval, pointed, as long as the two preceding together. Thorax one-third as broad again as long, brown, the lateral margins a little lighter, the sides lightly rounded and but little contracted anteriorly, the posterior angles rounded; the surface finely, closely and somewhat roughly punctured, finely pubescent. Elytra brownish-testaceous, infuscate at the scutellum, as long as, but a little broader than the thorax, transverse, with puncturation as on the thorax; humeral angles with a stout seta. Abdomen pointed, exceedingly finely and closely punctured throughout, exceedingly finely and closely pubescent as in the genus *Oxypoda*; sides and apex setiferous. Middle and posterior tibiae each with two long and strong setae.

Hab. Here and there, in dung.

128. Atheta (Acrotona) rufiventris, n. sp.

Rather shining; head black; thorax and abdomen bright reddish-testaceous; elytra, first three joints of the antennae and legs testaceous. Length 1·8 mm.

Head black, suborbicular, the eyes large and temples short, moderately finely and closely punctured, the pubescence fine and sparing. Antennae fuscous, the first three joints testaceous, the 2nd and 3rd of equal length, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate about twice as broad as long, the 11th longer than the two preceding together, pointed. Thorax bright reddish-testaceous, about half as broad again as long, the sides evenly rounded, more strongly narrowed in front than behind, the posterior angles rounded; puncturation and pubescence

similar to that of the head. Elytra testaceous, as long as and slightly broader than the thorax, transverse, not sinuate internal to the postero-external angles, with puncturation similar to that of the thorax but scarcely so close. Abdomen narrowed posteriorly, entirely bright reddish-testaceous, very finely and not very closely punctured anteriorly, the seventh and eighth segments much more sparingly; the sides and apex with long black setae. Intermediate tibiae each with two distinct black setae of which the middle one is the longer and stouter; posterior tibiae with two setae which are not so strong as those of the middle pair.

Hab. Bukit Panjang, in rotting fruit.

Exatheta, n. gen.

Labrum corneous, transverse, the anterior border truncate, the angles rounded. Mandibles moderate lightly curved, pointed, the right with a small tooth at the middle of the inner margin, both furnished internally with a ciliated membrane. Maxillary palpi 4-jointed, the 1st joint small, the 2nd narrow at the base, enlarged gradually towards the apex, the 3rd elongate, oval, longer than the 2nd, the 4th subulate, half as long as the 3rd. Inner lobe of maxilla corneous, rather narrow, the inner margin anteriorly with 7 or 8 rather short and stout pectinations, posteriorly ciliate; outer lobe membranous, the apex shortly ciliate. Tongue narrow and elongate, a little widened anteriorly and split nearly to the middle. Paraglossae distinct, ciliate. Labial palpi 2-jointed, the 1st joint elongate, slightly curved, cylindrical, longer than the tongue, the 2nd about half the length of the 1st, as wide at the base as the apex of the preceding and separated from it by an oblique suture, the apex slightly enlarged and rounded. Gular sutures widely separated, slightly divergent posteriorly. Temples bordered below. Prosternum feebly and obtusely angulate behind; mesosternal process bluntly pointed extending fully two-thirds of the length of the coxae, which are narrowly separated; metasternal process meeting the mesosternum, the apex rounded. Tarsal formula 4, 5, 5; anterior pair with the first three joints short and equal, the 4th longer than the preceding together; middle pair with the first four joints short and equal, the 5th as long as the preceding together; the posterior pair with the first four joints short and subequal, the 5th as long as the three preceding together. Elytra slightly sinuate internal to the postero-external angles.

The species on which this genus is founded has a facies somewhat resembling *Atheta canescens* Shp.

129. **Exatheta cingulata**, n. sp.

Rufous, rather shining, the head pitchy-red, the elytra black obscurely reddish at the shoulders; abdomen with the sixth segment a little infuscate; first three joints of the antennae, mouth-parts and legs reddish-testaceous. Length 1·1 mm.

Head transversely suborbicular, pitchy-red, the eyes large, their diameter greater than the length of the temples, moderately prominent, the disc exceedingly finely and moderately closely punctured, pubescence very fine and scanty. Antennae with the 1st and 2nd joints of equal length, the 3rd much shorter than the 2nd, the 4th small, transverse, the 5th to the 10th strongly transverse gradually increasing in breadth, the penultimate fully three times as broad as long, the 11th short conical. Thorax more than a third as broad again as long, widest just before the base, the sides slightly rounded and contracted anteriorly, bordered, the posterior angles obtuse, scarcely traceable, the base bordered; exceedingly finely (but more distinctly) punctured than the head, very finely and sparingly pubescent, in front of the base with a transverse row of rather obsolete larger punctures. Elytra a little longer and broader than the thorax, transverse, sinuate internal to the postero-external angles, finely, somewhat asperately and pretty closely punctured and finely pubescent. Abdomen but little narrowed behind, very finely and sparingly punctured and pubescent, the seventh and eighth segments almost glabrous. Tibiae without distinct setae.

Hab. Sembawang, in rotting fungus.

130. **Exatheta consors**, n. sp.

So similar to the preceding that enumeration of the points of difference should suffice. In build this species is a little more robust and somewhat larger (1·1–1·5 mm.), the thorax one-half as broad again as long, the antennae are a little longer but similarly formed, the puncturation of the head and thorax (especially the latter) is much more distinct and somewhat asperate, and a fine coriaceous ground-sculpture is also visible (which is absent in the preceding species); a transverse impression before the scutellum is sometimes present and the elytra are rather less finely punctured.

Hab. Sembawang, one specimen in rotting fungus and another in rotting fruit.

Mimatheta, n. gen.

Labrum corneous, transverse, feebly emarginate, the sides and anterior angles rounded. Mandibles moderate, lightly curved, pointed, the right with a distinct tooth at the middle of the inner margin. Maxillary palpi 4-jointed, the 1st joint small, the 2nd elongate, lightly dilated towards the apex, the 3rd scarcely longer than the 2nd, gradually and slightly thickened distally, the 4th subulate, half as long as the preceding. Inner lobe of the maxilla narrow, corneous, uncinate at apex, the inner margin strongly pectinate, the teeth rather short and stout; outer lobe membranous, ciliate-plumose at the apex. Tongue not so long as the 1st joint of the labial palpi, split nearly to the base into two narrow diverging lobes. Labial palpi 2-jointed, the 1st joint elongate, slightly curved and feebly constricted at the inner margin beyond the middle; 2nd joint narrower at the base, slightly enlarged towards the apex and rather more than half as long as the preceding. Gular sutures widely separated, slight divergent posteriorly. Temples bordered below. Mesosternal process gradually pointed, the apex rounded, extending for two-thirds of the length of the intermediate coxae which are moderately separated; metasternal process pointed gradually, the apex rounded, reaching the mesosternum. Tarsal formula 4, 5, 5. The anterior pair with the first three joints short and subequal, the last longer than the three preceding together; the middle pair with the 1st joint short, the 2nd and 3rd longer and subequal, the 4th a little longer than the 3rd, the 5th longer than the two preceding together; posterior pair with the 1st joint a little shorter than the 2nd, the 2nd, 3rd and 4th moderately elongate and subequal, the 5th scarcely as long as the two preceding together. All the claws simple, the empodium forming a spine. Middle tibiae with a distinct seta at the middle externally. Elytra scarcely sinuate.

The facies of the species on which this genus is founded is that of the *Atheta trinotata* group.

131. **Mimatheta fungicola**, n. sp.

Black, moderately shining. Elytra obscure testaceous, more or less infuscate at the sides. First three joints of the antennae, mouth-parts and legs testaceous. Length 2 mm.

Head very finely and sparingly punctured and pubescent, the eyes rather large but not prominent. Antennae with the 2nd and 3rd joints subequal, shorter than the 1st, the 4th small, transverse, the 5th and 6th longer than broad, the 7th as long as broad, the

8th to the 10th transverse, the penultimate fully half as broad again as long, the 11th elongate, pointed longer than the two preceding together. Thorax transverse, widest behind the anterior angles, the sides rounded and narrowed anteriorly, more strongly contracted posteriorly to the obtuse posterior angles, finely bordered, very finely and moderately closely punctured and pubescent. Elytra a little longer and broader than the thorax, transverse, very finely and moderately closely punctured and pubescent. Abdomen nearly parallel, very slightly narrowed posteriorly, very finely and rather sparingly punctured and pubescent, the seventh segment almost impunctate. Sexual differences unknown.

Hab. Mandai, in fungus.

Mimacrotona, n. gen.

Labrum corneous, transverse, truncate, the anterior angles rounded. Mandibles rather short and stout, curved, pointed, the right with a small tooth at the middle of the inner margin which in front is obscurely crenulate. Maxillary palpi 4-jointed, the 1st joint small, the 2nd elongate, slightly thickened distally, the 3rd as long as, but a little stouter than the 2nd, the 4th subulate not half the length of the 3rd. Inner lobe of the maxilla rather broad, the apex pointed, the inner margin furnished with moderately long and rather stout pectinations; outer lobe with apex spinose. Tongue rather short and broad, not extending to the level of the apex of the 1st joint of the labial palpi, split to the middle into two diverging teat-shaped lobes. Paraglossae distinct, ciliate, not extending much beyond the base of the 1st joint of the labial palpi. Labial palpi 2-jointed, the 1st joint rather stout, moderately long, the 2nd much narrower and a little shorter than the 1st, the apex rounded. Gular sutures distant, divergent posteriorly. Temples bordered below. Prosternum obtusely angled posteriorly, keeled; mesosternal process narrow, sharply pointed extending fully two-thirds the length of the coxae, which are narrowly separated; metasternal process pointed, reaching to the mesosternal. Tarsal formula 4, 5, 5; the anterior pair with the first three joints short and subequal, the 4th longer than the three preceding together; middle pair with the first four joints short and subequal, but longer than those of the front pair, the 5th as long as the three preceding together; posterior pair with the 1st joint a little longer than the 2nd, the 2nd, 3rd and 4th gradually decreasing in length, the 5th a little longer than the two preceding together. Middle and posterior tibiae without distinct setae. Elytra sinuate. Facies of *Acrotona*.

132. **Mimacrotona cingulata,** n. sp.

Rufo-testaceous, moderately shining, the head, fifth, sixth and base of the seventh abdominal segments blackish, the elytra more or less infuscate; first three joints of the antennae, mouth-parts and legs testaceous. Length 1·2 mm.

Facies of a minute *A. fungi* Grav. Head black or pitchy-black, suborbicular, very finely and rather closely punctured, finely pubescent. Antennae rather short, the 2nd and 3rd joints of equal length, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate fully two and a half times broader than long, the 11th rather short and stout. Thorax bright reddish-testaceous, nearly half as broad again as long, the sides lightly rounded and narrowed more strongly in front than behind, the posterior angles rounded, very finely and pretty closely punctured, finely pubescent. Elytra a little longer and broader than the thorax, transverse, the posterior margin sinuate internal to the postero-external angle; puncturation and pubescence similar to that of the thorax. Abdomen narrowed behind, finely and pretty closely punctured and pubescent anteriorly, more sparingly behind; lateral and apical setae weak. Intermediate and posterior tibiae without setae.

Hab. Bukit Panjang and Woodlands, in fungus.

Paratheta, n. gen.

Mandibles rather stout, curved, pointed, both furnished with a ciliate membrane internally; the right crenulate for the apical half of the inner margin. Maxillary palpi 4-jointed, the 1st joint small, the 2nd lightly curved and widened towards the apex, the 3rd a little longer than the 2nd, narrow at the base, gradually thickened towards apex, the 4th subulate, about half as long as the 3rd, distinctly constricted and narrowed before the apex (? accessory joint). Inner lobe of the maxilla narrow and pointed, corneous, the inner border with long and strong pectinations; outer lobe broader than the inner, ciliate at the apex. Tongue broad, scarcely longer than its breadth at the base, split to the middle into two teat-shaped lobes. Labial palpi obscurely 3-jointed, the 1st joint twice as long as broad, the 2nd as long as the 1st but narrower and obscurely separated from it by indistinct oblique suture, the 3rd almost as long as, but narrower than the 2nd, the apex rounded. Gular sutures distant, very slightly diverging behind. Temples bordered below. Prosternum truncate behind. Mesosternal pro-

cess rather broad, truncate posteriorly, keeled longitudinally in the middle, extending the whole length of the intermediate coxae which are rather widely separated. Metasternum truncate in front, reaching the mesosternum. Elytra sinuate internal to the postero-external angles. Tarsal formula 4, 5, 5; the anterior tarsi with the first three joints short and subequal, the 4th as long as the three preceding together; the middle with the first four joints short and subequal, but longer than those of the anterior pair, the 5th as long as the three preceding together; the posterior with the first four joints rather short, subequal, the 5th as long as the two preceding together. All the tibiae spinulose. Abdomen with the third, fourth and fifth dorsal segments transversely impressed at the base; the sides without setae.

The facies of the species on which this genus is founded is very similar to that of the fungi group of *Atheta*.

133. **Paratheta carnivora**, n. sp.

Black, rather shining; the elytra castaneous-brown; first three joints of the antennae and legs reddish-testaceous. Length 2 mm.

A rather narrow, fusiform species. Head suborbicular, the eyes moderate, not prominent, their diameter less than the length of the temples; puncturation fine, rather sparing, the front impunctate, pubescence scanty. Antennae with the 1st joint a little shorter than the 2nd, the 2nd and 3rd of equal length, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate almost two and a half times broader than long, the 11th conical, as long as the two preceding together. Thorax more than one-third broader than long, the sides evenly rounded, rather more narrowed in front than behind, the posterior angles rounded, finely, somewhat obsoletely and not very closely punctured, pubescence fine, rather stiff and sparing. Elytra as long as, but a little broader than the thorax, transverse, sculpture moderately fine, not very close and distinctly granular, the pubescence as on the thorax. Abdomen narrowed behind, the third to the fifth segments very finely and not very closely punctured, with at the bases a transverse row of rather larger and closer punctures, sixth to eighth segments gradually yet more finely punctured; pubescence sparing, fine and stiff.

Hab. Woodlands, in a small carcase.

Fenyesia, n. gen.

Maxillary palpi 4-jointed, the 1st joint small, the 2nd elongate, slightly curved and a little thickened towards the apex, 3rd elongate,

as long as but at the extremity broader than the 2nd, the 4th small subulate. The tongue moderately broad, bifid to the middle into two teat-shaped lobes. Paraglossae distinct ciliate, not extending beyond the tongue. Labial palpi 3-jointed, 1st joint rather short and stout, obliquely truncate at apex, the 2nd about as long as, but narrower than the 1st and indistinctly separated therefrom, the 3rd longer and narrower than the 2nd, cylindrical. Inner lobe of the maxilla narrow, pectinate internally; outer lobe broader, ciliate-plumose at apex. Mandibles rather stout, curved, the right with a tooth on the inner margin and crenulate between this and the apex, both with a ciliate membrane. Gular sutures divergent posteriorly. Temples bordered below. Prosternum obtusely emarginate posteriorly; mesosternal process narrow and pointed, the intermediate coxae very narrowly separated. Tibiae ciliate; tarsi slender, pointed, formula 4, 5, 5; the 1st pair with the first three joints short, equal, the 4th as long as the three preceding together; the 2nd pair with the first four joints moderately elongate, equal, the 5th nearly as long as the three preceding together; the 3rd pair with the 1st joint elongate, nearly as long as the last, twice the length of the 2nd, 2nd, 3rd, and 4th of equal length. Elytra not sinuate at the postero-external angle, the epipleurae complete. Thorax broader than the elytra, the posterior angles produced, the base bordered and bisinuate.

134. **Fenyesia nigra,** n. sp.

Black, shining, robust, convex; last two joints of the antennae and legs testaceous, the femora infuscate. Length 2 mm.

A broad robust little species with strongly transverse thorax (which is broader than the elytra) and somewhat pointed abdomen. Head large transverse concealed in the thorax nearly to the eyes which are moderate in size and not prominent; puncturation very fine, moderately close, finely pubescent. Antennae slender, pitchy, the last two joints testaceous, the 2nd and 3rd joints of equal length, the 4th to the 7th longer than broad, gradually decreasing in length, the 8th to the 10th as long as broad, the 11th rather large, oblong-oval, about as long as the two preceding together. Thorax strongly transverse, more than twice as broad as long, widest just behind the middle, the sides evenly rounded and contracted anteriorly, but less strongly posteriorly, posterior angles acute and produced, the base bordered and deeply bisinuate, very finely, uniformly and rather closely punctured, pubescence fine and ashy. Elytra as long as, but narrower than the thorax, transverse, puncturation and pubescence as on the thorax but rather coarser. Abdomen narrowed

posteriorly very finely and moderately closely punctured and pubescent, setose, the sides and apex with long black setae.

Hab. Woodlands, in rotten logs with Termites.

Myrmedonota, n. gen.

Maxillary palpi 4-jointed, the 1st joint small, the 2nd elongate, scarcely thickened towards the apex, the 3rd as long as the preceding, slightly widened towards the extremity, the 4th subulate, fully half as long as the 3rd. Tongue short and broad, the anterior border obtusely emarginate, the sides rounded. Labial palpi 3-jointed, the 1st joint rather short and stout, the 2nd shorter and narrower, the 3rd narrower and longer than the preceding. Inner lobe of the maxilla narrow and elongate, the inner border anteriorly feebly and sparingly pectinate, posteriorly ciliate; outer lobe longer than the inner, densely ciliate. Mandibles simple. Gular sutures parallel in front, divergent behind. Temples strongly bordered below. Neck rather narrow. Prosternum broadly rounded behind. Mesosternum short, truncate posteriorly extending but little between the middle coxae which are widely separated. Metasternal process produced, gradually narrowed to the apex which is rounded and does not reach the mesosternum. Tarsal formula 4, 5, 5; the anterior with the 1st joint short, the 2nd a little longer, equal to the 3rd, the 4th as long as the two preceding together; the middle with the 1st joint moderately long, the 2nd, 3rd and 4th gradually decreasing in length, the 5th as long as the two preceding together, longer than the 1st, the posterior with the 1st joint very little longer than the 2nd, the 2nd, 3rd and 4th gradually decreasing in length, the 5th shorter than the two preceding together, scarcely as long as the 1st. Abdomen with the lateral margins not abnormally elevated, nearly parallel, a little narrowed at the apex. Tibiae ciliate.

This genus is related to *Orphnebius* Motsch., and *Myrmedonia* Er.; it differs from the former in the parallel-sided abdomen, the sides of which are not abnormally elevated, and the strongly bordered temples.

135. **Myrmedonota cingulata,** n. sp.

Black or pitchy-black, shining; the first two visible abdominal segments testaceous-yellow; first two joints of the antennae and the legs testaceous, the apices of the femora and the tibiae pitchy. Length 3 mm.

Head large, transverse, nearly as wide as the thorax, eyes large

and somewhat prominent, the temples strongly narrowed behind; puncturation very fine and very sparing, each puncture with a stiff hair. Antennae with the 2nd joint shorter than the 3rd, the 4th to the 10th transverse, gradually increasing in width, the 11th conical, longer than the two preceding together. Thorax transverse, nearly a third broader than long, widest just before the middle, the sides bordered, evenly rounded and contracted anteriorly and more strongly posteriorly, posterior angles completely effaced, the sides passing insensibly into the base, which is similarly bordered; very finely and sparingly punctured, each puncture with a stiff hair; the anterior border on either side with a long seta, the sides each with three others. Scutellum triangular, the base very finely punctured, the apex impunctate. Elytra a little longer and wider than the thorax, transverse, with puncturation and pubescence as on the thorax, the sides with two setae. Abdomen with the anterior segments testaceous-yellow, the fifth to the eighth black; the sides setiferous.

♂. Abdomen glabrous and impunctate except for a very few setiferous punctures along the posterior margins of the fifth and sixth segments and a few similar ones towards the sides of the seventh and eighth segments; no visible ground-sculpture. Eighth abdominal segment feebly and broadly emarginate posteriorly and obscurely denticulate.

♀. Abdomen with a double row of setiferous punctures few in number, placed transversely on each segment, one row across the middle, the other along the posterior border; ground-sculpture fine and coriaceous. Eighth abdominal segment truncate posteriorly.

Hab. Sembawang, in logs associated with a species of Ant.

136. **Myrmedonia apicalis**, n. sp.

Black, shining, the base of the elytra rufescent, the second to the fifth dorsal segments of the abdomen bright testaceous-red. The first two joints of the antennae, mouth-parts and legs, testaceous. Length 3·8 mm.

In general appearance this species resembles to some extent the insects included under *Zyras*, s. str., and in view of the group being polymorphic and requiring considerable elucidation before a satisfactory arrangement can be arrived at, it is provisionally placed therein. Head transversely quadrate, the temples a little rounded and contracted posteriorly, the eyes moderate and not prominent, sculpture consisting of a very few scattered setiferous punctures,

otherwise glabrous. Antennae with the 2nd and 3rd joints of equal length, the 4th and 5th a little longer than broad, the 6th square, the 7th to the 10th transverse, gradually but very slightly increasing in breadth, the 11th oblong, rounded at the apex, longer than the two preceding together. Thorax a little transverse, widest just before the middle, the sides from thence rounded and narrowed anteriorly, more strongly contracted and slightly sinuate behind to the obtuse posterior angles; base and sides bordered, the former with a fovea in front of the scutellum; sculpture consisting of a few scattered setiferous punctures. Scutellum triangular, rather coarsely closely and deeply punctured. Elytra wider than and scarcely as long as the thorax, transverse, puncturation rather fine and by no means close, setiferous. Abdomen with the anterior segments bright testaceous-red, the sixth to the eighth black, shining glabrous and except for a transverse row of punctures at the bases of the anterior segments, impunctate.

Hab. At light, in the town. A single example.

Aleocharini.

Myrmedonella, n. gen.

Maxillary palpi 4-jointed, the 1st joint short, the 2nd rather short and stout, slightly curved, the 3rd elongate, oval, longer than the 2nd, the 4th short, subulate. Tongue moderately long, bifid at the apex into two diverging lobes. Labial palpi 2-jointed, the 1st joint elongate, cylindrical, lightly curved, the 2nd much shorter and narrower than the 1st, cylindrical. Prosternum broadly truncate posteriorly; mesosternum narrowed and truncate at apex extending for about one-half the length of the intermediate coxae, which are distant; metasternal process short and broad, not quite attaining the mesosternal process. Tarsal formula 5, 5, 5. The anterior pair with the 1st joint short, the 2nd a little longer, the 3rd still longer, the 4th as long as the 3rd, the 5th as long as the two preceding together. Middle pair with the first three joints of equal length, the 4th a little longer than the 3rd, the 5th as long as the two preceding together. Posterior pair with the first four joints subequal, moderately long, the 5th a little longer than the two preceding together. Tibiae ciliate. Elytra slightly sinuate internal to the postero-external angle. Abdomen with the third to the fifth segments transversely impressed at the bases.

The facies of the species on which this genus is founded somewhat resembles *Hoplandria* Kr. The entire insect

is covered with long sparing pubescence, intermixed with longer setae.

137. **Myrmedonella rufa,** n. sp.

Bright rufo-testaceous, shining, the elytra pitchy-red. Antennae, mouth-parts and legs reddish-testaceous. Length 1·8 mm.

Head large, transverse, the temples rounded, convergent and passing insensibly into the base; the eyes rather large and moderately prominent; puncturation very fine and sparing, pubescence sparing, long, erect. Antennae with long outstanding hairs, the 1st joint stout, the 2nd and 3rd of equal length, shorter than the 1st, the 4th a little longer than broad, the 5th and 6th as long as broad, the 7th to the 10th transverse, gradually increasing in breadth, the penultimate joints only slightly transverse, the 11th elongate pointed, as long as the three preceding together. Thorax one-half as broad again as long, widest just behind the anterior angles, the sides margined, lightly rounded and more contracted posteriorly, the posterior angles obtuse, the base slightly bisinuate, margined; puncturation very fine, obsolete and sparing; pubescence yellow, erect, rather long and scanty, intermixed with longer setae. Elytra as long as, but broader than the thorax, transverse, more obscurely coloured than the rest of the insect, puncturation very fine (but much more distinct than that of the thorax), sparing, pubescence and setae as on the thorax. Abdomen with the sides lightly curved, not much narrower at the apex than at the base, very finely and very sparingly punctured, pubescence erect, scanty and long.

Hab. Bukit Timah, associated with a species of Ant.

Paraleochara, n. gen.

Labrum transverse, the anterior margin truncate, the anterior angles rounded. Mandibles moderately long and stout, rather prominent, lightly curved and pointed at the apex, simple.

Maxillary palpi 5-jointed, the 1st joint small, the 2nd elongate, lightly curved and widened towards the apex, the 3rd a little longer than the 2nd, gradually widened towards the apex, the 4th small, subulate, about half as long as the preceding, the 5th very small, a little narrower than the 4th. Inner lobe of the maxilla narrow, slightly curved and pointed at the apex, the inner margin densely set with moderately long and rather fine pectinations; outer lobe oblong, lightly curved, densely ciliate at the anterior border.

Tongue moderately broad and moderately long, extending to the level of the apex of the 1st joint of the labial palpi and split to the middle into two narrow lobes. Labial palpi 4-jointed, the 1st joint stout, moderately long, the 2nd about as long but not quite so stout as the 1st, the 3rd shorter and narrower than the 2nd, the 4th narrower and shorter than the 3rd. Gular sutures narrowly separated and parallel in front, diverging gradually posteriorly. Temples strongly bordered below. First joint of antennae sulcate for nearly one-third its length above. Prosternum broadly rounded behind. Mesosternal process very short, extending but a little distance between the coxae, broad and truncate posteriorly; metasternal process produced, meeting the mesosternal process, broad and truncate anteriorly, its sides and apex finely bordered. Intermediate coxae distant. Tarsal formula 5, 5, 5. The anterior pair with the first four joints short and subequal, the 5th about as long as the three preceding together, claws simple, the pulvinus with a rather long spine. The middle pair with the first four joints short and subequal (but longer than those of the anterior pair), the 5th elongate, about as long as the three preceding together. The posterior pair with the joints elongate, the 1st longer than the following which gradually decrease in length. Elytra not sinuate. Third and fourth dorsal segments of the abdomen transversely impressed at the base.

The facies of the species on which this genus is founded is very similar to *Amarochara*.

138. **Paraleochara fungivora**, n. sp.

Shining castaneous, the elytra pitchy-black; abdomen reddish-testaceous, the sixth and seventh segments black. First three joints of the antennae, mouth-parts and legs testaceous. Length 2·9 mm.

Head orbicular, but produced in front, the mandibles prominent; eyes moderate, not prominent; puncturation very fine and very sparing, pubescence sparing, stiff and coarse. Antennae stout, the 1st joint laterally compressed, the apical third of the upper border sulcate, the 3rd a little shorter than the 2nd, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate nearly three times as broad as long, the 11th short, oval. Thorax transverse, one-fifth as broad again as long, widest at the middle, the sides rounded and contracted anteriorly, more strongly contracted posteriorly in a nearly straight line to the rounded posterior angles; puncturation fine, very sparing, pubescence coarse, stiff and

sparing; the sides and base finely bordered. Elytra blackish, scarcely as long as but a little broader than the thorax, transverse, very obsoletely and sparingly punctured, pubescence scanty, stiff and sparing. Abdomen parallel, the third, fifth and sixth segments with a few fine punctures, the rest nearly impunctate, pubescence very sparing and stiff.

♂ (?). Eighth dorsal segment narrowed, emarginate posteriorly.

Hab. Sembawang, in rotting fungus.

139. **Hoplandria frugivora**, n. sp.

Pitchy-brown, shining, lightly convex, attenuated posteriorly; the elytra darker, the base of the abdomen lighter; the first three and apex of the last joint of the antennae, infuscate, the first four joints and legs testaceous. Length 2·8 mm.

Head transversely orbicular, the eyes large, moderately prominent; exceedingly finely and exceedingly sparingly punctured and pubescent. Antennae with the 2nd joint a little shorter and narrower than the 1st, the 3rd a little shorter than the 2nd, the 4th a little longer than broad, the 5th to the 10th transverse, the penultimate twice as broad as long, the 11th stout, oval, pointed longer than the two preceding together. Mouth-parts testaceous, the 3rd joint of the maxillary palpi more or less infuscate. Thorax transverse, more than half as broad again as long, convex, broadest at the middle, the sides bordered, rounded and narrowed anteriorly and posteriorly, but rather more strongly in front, the posterior angles rounded, the base bordered, lightly sinuate on either side; puncturation and pubescence exceedingly fine and sparing, the disc with four larger punctures quadrately placed, but not always distinct; each side with two or three short setae. Elytra as long as and scarcely broader than the thorax, transverse, moderately finely and moderately closely asperately punctured; finely pubescent, the shoulders with a seta. Abdomen gradually pointed posteriorly, shining, exceedingly finely and exceedingly sparingly punctured, the sides and apex setiferous.

♂. Elytra with a small tubercle near the suture at the postero-internal angle; seventh abdominal segment with a longitudinal keel in the middle line and on either side with indications of three or four fine raised lines; eighth dorsal segment broadly emarginate posteriorly.

Hab. Mandai and Sembawang, in rotting fruit, and fungus.

Additions.

2 (*a*). **Lispinus sharpi**, n. sp.

Pitchy-black, shining. Antennae, legs and apex of the abdomen rufo-testaceous. Head, thorax and elytra distinctly punctured, ground-sculpture very obsolete. Length 2·5 mm.

Of the size and build of *L. impressicollis* Kr., but darker coloured, much more shining, less depressed, with much more distinct puncturation, and much less distinct ground-sculpture, lateral impressions of the thorax much less marked and the median impressions scarcely visible. Head with rounded impression on either side of the front, puncturation moderately fine and not very close, ground-sculpture scarcely visible. Antennae with the 3rd joint shorter than the 2nd, the 4th as long as the preceding, the 5th as long as broad, the 6th larger than the 5th, slightly transverse, 7th, 8th and 9th transverse, 10th as long as broad, 11th conical. Thorax more than one-third broader again than long, widest just before the middle, the sides slightly rounded and gradually narrowed anteriorly, contracted for the posterior third in a nearly straight line to the obtuse posterior angles, before which on either side is a narrow, elongate, not very well-marked impression before which is a rather large puncture; disc very obsoletely impressed on either side of the middle line before the base; puncturation moderately fine, much closer on the disc and more scattered towards the sides; ground-sculpture very indistinct. Elytra more than a third as long again as the thorax, longer than broad, rather more finely and distinctly less closely punctured than the disc of the thorax, ground-sculpture obsolete. Abdomen almost impunctate, distinctly coriaceous.

Hab. Mandai, under bark.

16 (*a*). **Pinophilus orientalis**, n. sp.

Black, moderately shining, the head with rather large and moderately close umbilicate puncturation, a triangular space on the front smooth and shining; thorax and elytra closely punctured. Antennae with the first two joints stout, fusco-testaceous, the rest very slender, testaceous; legs testaceous, the apex of the femora infuscate. Length 5·75–6·5 mm.

This species would appear to be closely allied to *P. thoracicus* Fauv., from the description given, but differing in the smaller size and the entirely black elytra. Head more shining than the other parts, the temples not dentiform and scarcely perceptible; the sculpture consisting of large and only moderately close umbilicate

punctures, the antennal tubercles and a triangular space whose base corresponds to the anterior margin completely smooth and shining. Antennae with the first two joints stout, fusco-testaceous, the rest very slender, all longer than broad and pale testaceous. Thorax a little wider than the head, transverse, widest at the junction of the 1st and 2nd fourths, the sides gradually rounded both anteriorly and posteriorly, but more strongly posteriorly and passing insensibly into the base; disc with a short, raised, shining keel before the scutellum and slightly impressed on either side of this; puncturation less coarse, but much closer than that of the head, scarcely umbilicate. Scutellum with five or six moderately large punctures. Elytra a little narrower, but about as long as the thorax, scarcely transverse, the puncturation of about the density and size of that on the thorax but somewhat rugulose; pubescence grey, rather long and sparing. Abdomen moderately finely and moderately closely punctured on the first three segments, rather more sparingly behind; pubescence long and grey.

♂. Sixth ventral segment with a moderately broad triangular excision.

Hab. Woodlands, in old logs.

On page 70 of these Transactions for 1918, a species named *Pinophilus notabilis* is described; further examination of this insect shows that a new genus must be formed for it, as although evidently closely allied to *Pinophilus*, it differs in certain details of structure.

Neopinophilus, n. gen.

Labrum transverse, the anterior margin broadly rounded with a deep moderately broad excision in the middle. Mandibles long, slender, curved, near the base of each furnished with a sharp tooth. Maxillary palpi 4-jointed, the 1st joint small, obconical, the 2nd elongate, slightly thickened towards the apex, the 3rd shorter than the 2nd, narrower at the base, widened towards the apex, subtriangular, the 4th fusiform, almost securiform, its outer aspect deeply sulcate throughout its length, longer than the 3rd. Inner lobe of the maxilla broad, truncate, the apical border densely but rather shortly ciliate; outer lobe membranous, narrower than the inner and a little longer, the apex and outer border densely covered with long cilia. The tongue broad, very similar to that of *Palaminus*, but completely bilobed, the broadly rounded antero-internal aspect of each lobe densely ciliate. Paraglossae prominent, not extending

beyond the lateral border of the tongue, shortly and closely ciliate. Labial palpi 3-jointed, the 1st joint rather stout, about twice as long as broad; the 2nd longer and much stouter than the 1st, oviform, furnished externally near the apex with two long and strong cilia; the 3rd a little shorter and much narrower than the 2nd, narrowed towards the apex which is truncate. Labium widest behind, deeply bisinuate in front. Mentum short and broad. Gular sutures separate, parallel. Temples strongly bordered below. Prosternal process carinate, acuminate; mesosternal process short, acuminate, extending but little between the intermediate coxae, which are contiguous in front; metasternal process acuminate, not reaching the mesosternal process. Anterior femora much thickened, all the tibiae setiferous. Tarsal formula 5, 5, 5. Anterior tarsi much dilated, the 1st joint triangular, transverse; the 2nd broader than the 1st; the 3rd broader than the preceding, the distal border emarginate; the 4th obcordate; the 5th elongate, claws simple; the first four joints each furnished below with a still broader membrane the margins of which are ciliate; middle pair with the 1st joint moderately long, the 2nd subtriangular, the 3rd nearly semicircular, the 4th lamelliform extending below the 5th (which is articulated to the dorsal surface near the base) for a short distance; posterior pair similarly constructed to the preceding. Posterior tibiae obliquely truncate before the apex, closely ciliate. Elytral epipleurae complete. Abdomen keeled at the base below.

The species on which this genus is founded has the facies of *Pinophilus*, but the labrum is bilobed and the last joint of the maxillary palpi is securiform. Type, *Pinophilus notabilis*, Trans. Ent. Soc. 1918, p. 70.

18 (*a*). **Palaminus bryanti,** n. sp.

Testaceous, shining, abdomen reddish-brown; elytra nearly half as long again as the thorax. Antennae and legs pale testaceous-yellow. Length 3·4 mm.

Size and coloration of *P. ceylanensis* Kr., but the antennae are more slender, the penultimate joints being longer, the thorax is less transverse and the sides posteriorly straighter, the posterior angles obtuse, the elytra are shorter and their puncturation less close. Head transverse, the temples dentiform, the puncturation coarse and pretty close, pubescence, stiff, yellow and sparing. Antennae with the first three joints equal in length, the 4th to the 10th longer than broad, gradually decreasing in length, the 11th long, oval, pointed, as long as the two preceding together. Thorax a little narrower than the head, slightly transverse, widest at the

rounded anterior angles, the sides almost straight and convergent from thence to the obtuse posterior angles; posterior half of the disc in the middle line with smooth raised line, puncturation coarse, umbilicate, sparing; pubescence coarse, stiff and scanty. Elytra wider than, and nearly half as long again as the thorax, puncturation rather coarse but more obsolete and closer than that of the thorax, pubescence long, stiff and yellow. Abdomen with imbricate sculpture of the first four visible segments, the following with a few asperate punctures; pubescence as on the fore-parts.

Hab. Bukit Timah. Collected by *G. E. Bryant.*

19 (*a*). **Astenus castaneus,** n. sp.

Rufo-castaneous, shining; antennae slender, pale testaceous; legs pale testaceous. Length 4·3–5·5 mm.

In size and build very similar to *A. fitum* Aubé, except that the head is larger and more orbicular and the antennae much longer and more slender. Head large, the temples broadly rounded passing insensibly into the base, sculpture close and umbilicate. Antennae with all the joints much longer than broad, the 2nd joint shorter than the 1st, the 3rd longer than the 2nd, the 4th to the 11th differing but little if at all in length and thickness. Thorax narrower than the head, subpentagonal, the anterior angles distinct, one-fifth as long again as broad, the sides with 6 or 7 long setae. Sculpture similar to that of the head. Elytra scarcely wider than the thorax at the anterior angles and of the same length, more shining than the fore-parts and rather lighter in colour, puncturation very coarse and close. Abdomen elongate, the first four visible segments rather coarsely punctured in transverse rows, the fifth and sixth much more finely and irregularly punctured; pubescence long and stiff. Anal styles elongate, lightly curved downwards.

♂. Sixth ventral segment produced, narrowed, the sides sinuate, the posterior border with a deep and moderately broad excision the sides of which are parallel and the apex rounded; fifth ventral segment with a small feeble emargination at the middle of the posterior border, in front and corresponding to this is a horseshoe-shaped impression, studded with a few black granules.

Hab. Bukit Panjang, in débris.

22 (*a*). **Medon** (s. str.) **orientalis,** n. sp.

Pitchy-red, nearly opaque, the elytra and abdomen rather more shining, the former with the postero-external angles and often with

more or less of the posterior half, infuscate. Antennae, mouth-parts and legs reddish-testaceous. Length 3 mm.

Allied to *M. opacellus* Fauv., but smaller and narrower, the antennae more slender, the vertex of the head a little shining, the sculpture consisting of close simple punctures not at all rugulose on the disc, but only granular at the base and temples. Head large, transversely quadrate, the posterior angles rounded, the base feebly emarginate; the eyes moderate; sculpture on the disc consisting of moderately large close punctures, at the sides, base and temples of small granules. Antennae slender, the 2nd joint a little shorter than the 3rd, the 4th to the 6th all a little longer than broad, gradually decreasing in length, the 7th to the 10th about as long as broad. Thorax scarcely broader than long, the sides narrowed from the apex to the base and setose; sculpture consisting of a fine close granulation, the disc with a trace of a smooth median line. Elytra longer and a little broader than the thorax, longer than broad, with a close (but not so close as on the thorax) granular sculpture; pubescence fine and yellow. Abdomen closely and finely punctured throughout; pubescence close, yellow.

♂. Seventh ventral segment with a deep emargination; sixth ventral segment with a broad, but not deep emargination.

Hab. Mandai, in débris.

26 (*a*). **Medon (Charichirus) terminalis,** n. sp.

Black, opaque (greasy lustre only), the posterior third of the elytra dull reddish. Antennae black, the last three or four joints reddish-testaceous; legs pitchy. Length 5·5 mm.

Exactly similar in build and puncturation to *C. chinensis* Boh., but at once distinguished by the dark antennae, the infuscate legs, the more obscure coloration of the elytra and the blacker abdomen.

Hab. Keppel Harbour, in débris.

On page 85 (Trans. Ent. Soc. 1918) of the first part of this paper, two species referred to the genus *Holisus* were described, but further investigation into their structure shows that although possessing a remarkable resemblance to this genus, yet the structure of the mouth-parts and tarsi is so different that it is necessary to form a new genus for their reception, which would appear to form a transition between the Bolitocharini and the Staphylinini, the genus *Thectura* probably being the closest relation in the former group.

Holisomimus, n. gen.

Antennae distant, situated on the front margin of the head, just external to the level of the inner margin of the mandibles. Eyes small and flat. Mandibles long, stout, prominent, the right pointed at the apex and with a tooth at the middle of the inner margin, the left thickened at the apex, which is excavated internally. Maxillary palpi 4-jointed, the 1st joint small, the 2nd elongate, lightly curved and slightly thickened towards the apex, the 3rd a little longer than the 2nd, the 4th subulate, about half as long as the 3rd. Outer lobe of the maxilla elongate, truncate at the apex, which is ciliate; inner lobe narrower than the outer, uncinate at the apex, strongly pectinate along the inner margin. Tongue broad membranous, gradually narrowed towards the apex, which is divided for a short distance into two bluntly pointed lobes. Labial palpi 2-jointed, the 1st joint elongate, cylindrical, the 2nd narrower and a little shorter than the 1st, the apex rounded. Mentum (pars antica) short, transverse, broadly emarginate in front. Temples not bordered below. Gular sutures coalescing posteriorly. Prosternum large, triangular, obtusely pointed behind. Mesosternal process very short, scarcely extending between the intermediate coxae, which are contiguous. Femora stout. Tarsal formula 4, 4, 5; the anterior and intermediate pairs with the first three joints short and subequal, the 4th rather longer than the three preceding together; the posterior pair with the first four joints short and subequal, the 5th about as long as the three preceding together.

This genus is founded on the species described (*loc. cit.*) as *Holisus parvus* and *H. cingulatus*.

46 (*a*). **Conosoma malayanum,** n. sp.

Black, moderately shining, the posterior border of the thorax narrowly, the postero-external angles more broadly rufescent; elytra with small obscure reddish spot in the middle of basal margin. Antennae filiform, the first three and the last joints clear testaceous. Length (extended) 5·3 mm.

In build identical with *C. pubescens* Gr., but differs in the coloration, much longer antennae, much shorter elytra and more strongly setose abdomen. Antennae filiform, all the joints longer than broad, the 11th longer than the 10th. Thorax black, very finely and moderately closely punctured and pubescent, the postero-external angles and posterior margin rufescent but not sharply so. Elytra scarcely as long as the thorax, transverse, as finely but less closely punctured than in *C. pubescens*, finely pubescent, the base with a

small ill-determined rounded reddish spot which does not extend to the suture or the lateral margin. Abdomen elongate, strongly pointed, very finely and closely punctured and pubescent throughout, the lateral setae stronger than in *C. pubescens*. Posterior tarsi longer than the tibiae.

Hab. Ang Mo Kio, in rotten timber.

56 (*a*). **Coproporus varians,** n. sp.

Black, shining, the extreme lateral margins of the thorax and of the elytra, the posterior margins of the dorsal segments of the abdomen, rufescent. Antennae, mouth-parts and legs reddish-testaceous. Length 2·2 mm.

Var. 1. Thorax pitchy-red; elytra posteriorly near the suture more or less rufescent.

Var. 2. Entirely pitchy-red.

A variable species as regards coloration, which is probably related to the degree of maturity. Of about the build of *C. minimus* Motsch., but considerably larger and rather more convex, with the antennae considerably shorter, the 4th joint being transverse and the penultimate much more transverse than in that species; the elytra, moreover, do not present the fine wrinkling seen in *C. minimus*. Head black, shining, finely strigose transversely, with a very few, scarcely visible, punctures. Antennae with the 2nd joint shorter than the 1st and 3rd, the 4th to the 10th transverse, gradually increasing in breadth, the penultimate nearly twice as broad as long, the 11th conical. Thorax at the base, twice as broad as long, exceedingly finely and by no means closely punctured and without visible ground-sculpture. Elytra transverse, at the base as wide as, but a little longer than the thorax, narrowed behind, with sculpture similar to that of the thorax. Abdomen exceedingly finely and not very closely punctured, with a fine, short sparing yellow pubescence. Eighth dorsal segment posteriorly divided into four narrow pointed processes.

Hab. Woodlands, under bark.

XI. *A Contribution to our knowledge of the Life-history of the Stick Insect*, Carausius morosus *Br.* By George Talbot, F.E.S.

[Read March 17th, 1920.]

Synopsis.

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1. Introduction.

The observations here set forth were made during the years 1910, 1911, and 1912. They were carried out under various difficulties, and are not so thorough nor so extensive as those given to the entomological world by Mr. H. Ling Roth in his exhaustive paper published in these Transactions for 1916, p. 345. My results are not entirely the same, but the conditions under which the insects were reared were different. The most striking difference is seen in the number of moults; in most cases only three were observed and four on only two occasions, never five nor six.

I do not give here any notes on the mode of oviposition, emergence from the egg, and general habits, which differ in no particular from the observations made by Roth.

The specimens were kept in wooden boxes fitted with glass on one side and perforated on another side to admit plenty of air. These were stood on end on small receptacles containing water into which the stem of the food-plant was placed. The insects were fed on privet. [*Cont. on p.* 293.]

2. GENERAL LIFE-HISTORIES.

	Parent A.	Parent B.	Generation B1. Specimen 1.	Generation B1. Specimen 2.	Parent C.	Generation C1.
Date when egg was deposited by parent.	—	—	17.viii.'11.	8.ix.'11, 5–11 p.m.	—	28.viii.'11, 3–5 p.m.
Date of hatching.	Between 2.v.'11 and 3.v.'11.	13.xii.'10.	16.iv.'12, a.m.	28–29.v.'12.	27.xi.'10.	3.v.'12.
Period of incubation.	—	—	242 days.	262 days.	—	248 days.
1st ecdysis.	12–14.viii.'11. Only skin of one leg found.	30–31.iii.'11.	1.vi.'12.	Between 25.vi.'12, 7 p.m., and 26.vi.'12, 6 p.m.	18–24.v.'11.	13–15.vi.'12.
2nd ecdysis.	1–2.ix.'11.	1–7.vi.'11.	13.vii.'12.	28–30.vi.'12.	17–27.vi.'11.	1–6.vii.'12.
3rd ecdysis.	22–23.x.'11.	1–7.vii.'11.	1–3.viii.'12.	17–20.ix.'12.	13–20.vii.'11.	7–8.ix.'12.
4th ecdysis.	Not observed.	Not observed.	Not observed.	Not observed.	Not observed.	Not observed.
Commencement of oviposition.	12–10.i.'12.	15.viii.'11.	About 20.viii.'12.	About 4.xii.'12.	12.viii.'11.	Not observed.
Period of post-embryonic development.	257 days.	245 days.	126 days.	189 days.	258 days.	Not known.
Rate of oviposition.	14–19.i., one; 19–22.i., one; 23.i., none; 25.i., two; hereafter an average of one per day.	First 20 days, 40. Average from Aug.–Oct., 1–2 per day; from Nov.–Jan., one in 2 days.	3–9.ix., 15; 9–20.ix., 19; 20.ix.–13.x., 44; 13.x.–9.xi., 44; 9.xi.–8.xii., 32.	8.xii.'12 to 23.iii.'13, 50.	First 20 days, 46; Sept. and Oct., average 2 in 3 days; Nov. to Jan., one in 2 days.	8.xii.'12 to 23.iii.'13, 86.
Period of oviposition.	325 days.	445 days.	Not known.	Not known.	286 days.	Not known.
Total number of eggs.	436.	456.	Exceeding 150.	Not known.	486.	Not known.
Age of specimen at death.	About 580 days.	692 days.	Not known.	About 312 days.	554 days.	Not known.

	Parent D.	Generation D1. Specimen 1.	Generation D1. Specimen 2.	Parent E.	Generation E1. Specimen 1.	Generation E1. Specimen 2.
Date when egg was deposited by parent.	—	17.viii.'11. 9.30 a.m.–6 p.m.	22.viii.'11. 2–6 p.m.	—	20.viii.'11. 7–10 p.m.	10.ix.'11. 6–12 p.m.
Date of hatching.	13.xii.'10.	24.iv.'12.	26.iv.'12.	14.xii.'10.	1.v.'12.	27.v.'12.
Date of incubation.	—	248 days.	247 days.	—	254 days.	254 days.
1st ecdysis. 2nd ecdysis.	28.vi.–24.vii.'11. Not observed.	4–8.vi.'12. 25–26.vi.'12.	19.v.'12. 8.vi.'12.	7–17.vi.'11. 13–20.vii.'11.	11–17.vi.'12. 16.vii.'12.	19–22.vii.'12. 17–24.viii.'12.
3rd ecdysis.	Not observed.	10.viii.'12. Observed only skin of legs, two being complete.	12–16.ix.'12. A portion only found.	Not observed.	Not complete. 8.viii.'12.	13–16.ix.'12.
4th ecdysis.	Not observed.	7–8.ix.'12.	Not observed.	Not observed.	Not observed.	Date uncertain, but found a cast on 4.xi.'12.
Commencement of oviposition.	19.viii.'11.	About 5.x.'12.	About 1.x.'12.	9.viii.'11.	About 30.ix.'12.	About 1.xii.'12.
Period of post-embryonic development.	249 days.	164 days.	157 days.	238 days.	153 days.	188 days.
Rate of oviposition.	First 20 days, 43; average for Sept. and Oct., 3 in 2 days; from Nov.–Jan., one in 2 days.	First 8 days, 12; Oct. 13–Dec. 8, 62; Dec. 8–Mar. 23, 84.	5–13.x., 10; 13.x. to 8.xii., 62; 8.xii. to 23.iii., 80.	First 20 days, 32; average for Sept. and Oct., 2 in 3 days; Nov. to Jan., one in 2 days.	Sept. 30–Oct. 5, 23; 5–13.x., 8; 13.x.–8.xii., 79; 8.xii.–23.iii., 97.	Between 8.xii. and 23.iii., 57.
Period of oviposition.	148 days.	Not known.	Exceeding 500 days.	447 days.	Exceeding 316 days.	Exceeding 400 days.
Total number of eggs.	139.	Not known.	Not known.	458.	Not known.	Not known.
Age of specimen at death.	About 401 days.	Exceeding 500 days.	629 days.	685 days.	Exceeding 470 days.	Exceeding 467 days.

DESCRIPTIONS OF SPECIMENS.

Parent A.	At first green, but later changed to pale buff speckled with black.
Gen. A1.	33 specimens were bred. All these, with exception of one tinged with reddish-brown, were light green.
Parent B.	At first green, but later changed to earth-brown with a dorsal patch of pale buff on the fourth abdominal segment.
Gen. B1.	
Spec. 1.	June 1st, after first ecdysis.—Pale yellowish-green.
	July 13th, after second ecdysis.—Colour unchanged.
	Aug. 3rd, after third ecdysis.—Colour unchanged.
	Dec. 8th.—Green. Mesothorax below pinkish, abdomen below paler green.
Spec. 2.	July 30th, after second ecdysis.—Dark earth-brown with a slight tinge of green. Skin wrinkled and rugose.
	Sept. 20th, after third ecdysis.—Darker and without green tinge.
	Dec. 8th.—Very dark earth-brown; ventral surface, except of mesothorax, paler.
	April 6th.—Nearly black. Abdomen with a pale lateral stripe, mesothorax paler below.
Gen. B2.	
Specs. 1–10.	Light green, underside pale yellow; a more or less distinct orange spot at base of metasternum; base of anterior femora on inside faintly reddish.
Spec. 11.	Speckled with brown; thorax more rugose than in the others.
Specs. 12–13.	Dark green. Thorax rugose. Base of anterior femora reddish. Below paler green and speckled with yellow.
Parent C.	Green.

Gen. C1.	
Spec. 1.	June 4th.—Pale dirty green with dark lateral stripes, and two dorsal stripes of dark brown on head and thorax; abdomen not striped.
	June 15th, after first ecdysis.—Colour unchanged.
	July 6th, after second ecdysis.—Colour unchanged.
	Sept. 8th, after third ecdysis.—Grey, with a faint pink tinge, and speckled with bluish-black markings; ventral surface paler. Wart-like points numerous, black, tipped with grey. Legs and head below sea-green, the legs paler and much speckled.
	Dec. 8th.—Uniformly pale ochreous with a pink tinge and speckled with black points.
	April 6th.—Colour unchanged except that the abdomen bears a rusty-brown lateral stripe.
	Sept. 7th.—Colour unchanged except that the abdominal stripe is absent and abdomen paler below.
Gen. C2.	
Spec. 1.	Pale green above, pale yellowish-brown below.
Spec. 2.	Pale ochreous tinged with green, pale brown below. Legs dark green.
Specs. 3–5.	Pale ochreous tinged with green.
Parent D.	Green. Abdomen almost smooth with few granulations. Head and thorax closely granulated.

DESCRIPTIONS OF SPECIMENS.

Gen. D1.	
Spec. 1.	June 4th.—Pale green.
	June 8th, after first ecdysis.—Yellowish-green.
	June 26th, after second ecdysis.—Legs green, spotted with black; antennae greyish. Above: Head and pronotum light green with some black spots; thorax yellowish-green marked with black spots and dark dorsal areas of green; abdomen yellowish-green, joints of segments marked with black spots; head and thorax with small wart-like projections, the larger of which are black. Underside paler.
	Aug. 10th, after third ecdysis.—Colour much darker. Ground-colour olive-green mottled with brown. Increase of wart-like projections which are sparsely distributed over the abdomen. Underside grey, metathorax darker. General colour a greyish-green.
	Sept. 8th, after fourth ecdysis.—Colour darker, a dirty brown. Differs chiefly from preceding stage in the whole ventral and under surface being coloured as the upper. Legs spotted with yellowish-green.
	Dec. 8th.—Colour earth-brown with greenish and pinkish mottlings. Underside of mesothorax reddish, and abdomen with a reddish lateral stripe.
	April 6th.—Almost black with pale greenish and yellowish mottlings. Underside of mesothorax pale brown.
	Sept. 7th.—Colour unchanged.

D1.	
Spec. 2.	June 4th, after first ecdysis.—Pale green.
	Sept. 16th, after third ecdysis.—Ochreous, no green tint present.
	Dec. 8th.—Pale ochreous with faint pink tinge. Lower surface of mid-femora orange, of anterior femora scarlet at base. Under surface of mesothorax paler. Abdomen with lateral reddish stripe, and ventral surface more speckled than the dorsal.
	April 6th.—Colour unchanged.
	Sept. 7th.—Colour much darker.
Spec. 3.	Light yellowish-green, paler below.
Spec. 4.	Dark green. Thorax somewhat rugose. Underside paler and yellowish.
Gen. D2.	
Specs. 1–8.	Pale green tinged with yellow.
Spec. 9.	Dark green. Thorax somewhat rugose. Underside pale and yellowish.
Parent E.	Dark olive-green. The fourth abdominal segment bears a dorsal patch of pale buff.
Gen. E1.	June 4th, before first ecdysis.—Wholly pale green, but legs and antennae with little colour, last segment of antennae distinctly brownish.
	Aug. 8th, after third ecdysis.—Colour unchanged except that the abdomen bears a dark lateral stripe.
	Sept. 7th.—Colour unchanged.

DESCRIPTIONS OF SPECIMENS.

E1.	
Spec. 2.	May 27th, after emergence from egg.—Ground-colour pale greenish-yellow, mottled strongly with brown.
	July 27th, after first ecdysis.—Colour more greenish.
	Aug. 24th, after second ecdysis.—Pale ochreous, ventral surface light grey.
	Sept. 16th, after third ecdysis.—Colour a little darker.
	Nov. 9th, after fourth ecdysis.—Colour unchanged.
	Dec. 8th.—Head and thorax earth-brown, metathorax and abdomen pale ochreous. Thorax below dark reddish-brown; anterior and intermediate legs same colour as thorax, posterior legs same colour as abdomen; under surface of intermediate femora orange near base, of anterior femora scarlet near base.
	April 6th.—Colour unchanged.
	Sept. 7th.—Abdomen darker, only slightly paler than thorax.
Gen. E2.	
Specs. 1–5.	Colour light green.
Spec. 9.	Pale ochreous tinged with green.

The boxes were kept in a room without artificial heating. During some periods of cold weather the temperature of the room must have been below 40° F.

Roth kept his insects in inverted glass bell-jars in a room maintained at a certain temperature. It is certain that the temperature inside his bell-jars was higher than outside, but only the room temperature is given.

The eggs for incubation were kept in ordinary chip boxes in the room with the insects, and no moisture was given them.

3. Egg Development.

An egg is deposited at intervals of from 4 to 6 hours, but during an interval of 96 hours only from 8 to 10 are deposited. There are intervals of 20 to 40 hours during which none are laid, and it is during this time that others are developed for deposition at further intervals of from 4 to 6 hours. It would appear that 8 to 10 eggs are developed at one time though at different stages, so that when one is laid another is beginning to form.

During 96 hours there is altogether an interval of from 40 to 60 hours during which none are laid, and the longer the interval the fewer are laid. However the interval of rest may vary, the number of eggs laid is still one for every period of 4 to 6 hours.

In one case, during 96 hours 10 eggs were deposited with a total rest interval of 42 hours. In another case, during 96 hours 6 eggs were deposited with an interval of 56 hours.

A lengthened period of rest does not result in the development of more eggs. One egg in each ovarian tube is ready almost at the same time, the succeeding egg being far behind in development. As soon as these ripe eggs have been discharged, the period of rest supervenes until the next batch is ready.

Eggs were mostly deposited between the hours of 6 p.m. and 10 a.m.

Eggs are deposited at less frequent intervals from the age of 320 to 400 days, and these intervals increase in length until on the average half the number of eggs is produced in the same time.

The egg is visible within the anal cavity several hours before it is dropped.

4. VARIATION IN EGGS.

Specimen.	No. of the egg in series depos.	Peculiarity.
A.	7th	Small. The knob scarcely projects from its cavity, being almost flat.
	8, 9, 10	The knob is conical.
	14–37	Includes 3 small ones.
	38–47	One is smaller than usual, of a reddish-brown colour, and with conical knob.
	53–61	Two of these are small.
	257–316	One of these is only about size of a pin's head, and very dark in colour. Cap nearly normal size.
B.	154–157	One small one.
	160	Slaty-grey in colour. Knob flatter than usual.
	161–164	The knob of these is conical.
	221–246	A few of these are very small.
	443–455	One of these is only about size of a pin's head.
C.	177–179	One rather small.
	229–252	A few of these are very small.

The data contained in the general life-histories is displayed and summarised in the following tables, 5–15.

5. PERIOD OF INCUBATION OF THE EGG.

Specimen.	Date of Deposition of Egg.	Date of Emergence.	Period of Incubation. Days.
B1. Gen. 1.	17.viii.	16.iv.	242
B2. Gen. 1.	9.ix.	28–29.v.	262
C1. Gen. 1.	28.viii.	3.v.	248
D1. Gen. 1.	17.viii.	24.iv.	250
D2. Gen. 1.	22.viii.	26.iv.	247
E1. Gen. 1.	20.viii.	5.v.	254
E2. Gen. 1.	9.ix.	27.v.	229

It will be seen from this table that the data was obtained in respect of eggs which necessarily passed a period of their development during the winter months. The average period of incubation obtained under these conditions is 247 days. The observations of Mr. Roth, *l. c.*, who kept his eggs at a temperature ranging from 56° F.–64° F., show a period of 137–297 days for incubation under those conditions.

6. PERIOD OF INCUBATION OF TWO OR MORE EGGS DEPOSITED WITHIN 24 HOURS.

No. of Eggs Laid.	Date when Eggs were Laid.	Date of Hatching of			Approximate Period of Incubation. Days.	Range. Days.
		First Egg.	Second Egg.	Third Egg.		
3	11 p.m. 26.viii.'11–11 p.m. 27.viii.'11.	25.iv.'12.	26.iv.'12.	26.iv.'12.	244–245	1
2	6 p.m. 22.viii.'11–10.30 p.m. 23.viii.'11.	27.iv.'12.	30.iv.'12.	—	247–250	3
3	6.30 p.m. 25.viii.'11–10-30 a.m. 26.viii.'11.	5.v.'12.	9.v.'12.	17.v.'12.	253–265	12
2	6–10 p.m. 29.viii.'11.	13.v.'12.	14–16.v.'12.	—	258–261	3
2	6–9.30 p.m. 1.ix.'11.	13.v.'12.	14–16.v.'12.	—	255–258	3
2	2–3.ix.'11.	14–16.v.'12.	19.v.'12.	—	256–260	4
2	5–12 p.m. 7.ix.'11.	20–23.v.'12.	7.vi.'12.	—	257–273	16
3	6–12 p.m. 10.ix.'11.	24–26.v.'12.	27.v.'12.	—	259–261	2
2	5–11 p.m. 8.ix.'11.	28–29.v.'12.	9.vi.'12.	—	264–275	11
4	5–12 p.m. 7.ix.'11.	9.vi.'12.	12.vi.'12.	—	276–279	3
6 Deposited by 3 specs.	2–3.ix.'11.	20–23.v.'12.	20–23.v.'12.	20–23.v.'12.	261–263	2
3	15.viii.'11.	6.iv.'12.	14.iv.'12.	—	235–243	8

7. THE ECDYSES.

(Figures in brackets indicate day counted to or from.)

Spec. No.	Date of Hatching.	1st Ecdysis.	2nd Ecdysis.	3rd Ecdysis.	Days between Hatching and 1st Ecdysis.	Days between 1st and 2nd Ecdysis.	Days between 2nd and 3rd Ecdysis.	Age at 3rd Ecdysis.
B.	13.xii.	30–31.iii. (30).	1–7.vi. (4).	1–7.vii. (4).	107	66	30	203
B1.	16.iv.	1.vi.	13.vii.	1–3.viii. (2).	45	42	20	107
B2.	28–29.v. (28).	25–26.vi. (25).	28–30.vii. (28).	17–20.ix. (18).	28	34	20	82
C.	27.xi.	18–25.v. (21).	17–27.vi. (21).	13–20.vii. (16).	175	31	25	231
C1.	3.v.	13–15.vi. (14).	1–6.vii. (3).	7–8.ix.	42	19	66	127
D.	15.xii.	28.vi.–4.vii.(30.vi.).	Not seen.	Not seen.	199	—	—	199
D1.	24.iv.	4–8.vi. (4).	25–26.vi.	10.viii. 4th ecdy., 7–8.ix.	41	51	46 3rd–4th, 28.	138 At 4th, 166.
D2.	26.iv.	19.v.	8.vi.	12–16.ix. (14).	23	20	98	141
E.	14.xii.	7–17.vi. (12).	13–20.vii. (16).	Not seen.	180	34	—	214
E1.	1.v.	11–17.vi. (14).	16.vii.	8.viii.	44	32	23	99
E2.	27.v.	19–22.vii. (20).	17–24.viii. (20).	13–16.ix. (14). 4th ecdy., 9.xi.	54	31	25 3rd–4th, 56.	110 At 4th, 166.
A.	2–3.v. (2).	12–14.viii. (13).	1–2.ix. (1).	22–23.x. (22).	103	19	52	174
				Average . .	86	34	10	152

8. SUMMARY OF MOULTING PERIODS.

Time of Development between	Days.	Range in Days.
Hatching and 1st ecdysis.	23–199	176
1st and 2nd ecdysis.	19–66	47
2nd and 3rd ecdysis.	20–98	78
3rd and 4th ecdysis.	28–56	28
Age at 3rd ecdysis.	82–214	132
Age at 4th ecdysis.	166	0

9. OVIPOSITION.

Specimen.	Period of Oviposition Days.	No. of Eggs produced.	Rate of Deposition.		
			First 20 Days.	First 2 months.	Second 3 Months.
B.	445	186	10	1–2 per day	1 in 2 days
C.	286	313	46	2 in 3 days	1 in 2 days
E.	447	458	22	2 in 3 days	1 in 2 days
A.	325	136	—	1 per day	1 per day
D.	148	139	43	3 in 2 days	1 in 2 days
B2.	—	—	50	in 3 months.	
Average	330	366	37	1 per day.	1 in 2 days

10. POST-EMBRYONIC DEVELOPMENT AND LONGEVITY.

Specimen.	Date of Emergence from Egg.	Date of 3rd Ecdysis.	Oviposition commenced.	Approximate Period between 3rd Ecdysis and Oviposition.	Approximate Period of Post-embryonic Development.	Age at Death. Days.
A.	2–3.v.'11.	22–23.x.'11.	14–19.i.'12.	86	257	580
B.	13.xii.'10.	1–7.viii.'11.	15.viii.'11.	42	245	692
B1.	16.iv.'12.	1–3.viii.'12.	About 20.viii.'12.	18	126	Above 229
B2.	28–29.v.'12.	17–20.ix.'12.	About 4.xii.'12.	77	189	About 312
C.	27.xi.'10.	13–20.vii.'11.	12.viii.'11.	27	258	551
D.	13.xii.'10.	28.vi.–4.vii. (Only one observed)	19.viii.	50	249	401
D1.	24.iv.'12.	7–8.ix.	About 5.x.	28	161	Above 500
D2.	26.iv.'12.	12–16.ix.	About 1.x.	17	157	629
E.	14.xii.'10.	13–20.vii. (Second and last seen)	9.viii.	24	238	685
E1.	1.v.'12.	8.viii.	About 30.ix.	53	153	Above 470
E2.	27.v.'12.	9.xi. (IIIrd ecdysis)	About 1.xii.	22	188	Above 167
Average				40	202	501

11. RATE OF GROWTH.

Specimen.	1st Ecdysis.		2nd Ecdysis.		3rd Ecdysis.		Maximum Length attained. Mm.	Increase between 1st and 2nd Ecdysis. Mm.	Increase between 2nd and 3rd Ecdysis. Mm.	Age when Maximum Length attained. Days.
	Age. Days.	Length. Mm.	Age. Days.	Length. Mm.	Age. Days.	Length. Mm.				
B1.	46	29	88	31	108	70	75	2	39	351
B2.	28		61	—	113	55	70			312
C1.	42	24	61	29	127	35	77	8	6	223
D1.	11	27	62	36	108	62	80	9	26	147
D2.	23	19	13	27	141	71	78	8	17	Above 345
E1.	11	24	76	11	99	57	75	20	13	253
E2.	54	38	85	16	110	60	76	8	11	191
Average	39·7	26·3	68	35·5	115·1	59	75·8	9·1	24·1	261

12. MEASUREMENTS AT MAXIMUM GROWTH.

(Made on living specimens.)

Specimen.		Head. Mm.	Prothorax. Mm.	Mesothorax. Mm.	Metathorax. Mm.	Abdomen. Mm.	Total Length.	Femora.		
								Anterior. Mm.	Intermediate. Mm.	Posterior. Mm.
B1.	1st Gen.	4	4	17	12	38	75	17	12	15
B2.	1st Gen.	3·5	3·5	16	11	36	64	16	12	14
C1.	1st Gen.	4	4	17	12	40	77	16	12	14
C1.	2nd Gen.	3	3	16	11	35	68	14	10	13
C2.	2nd Gen.	3·5	3·5	17	11	36	70	15	11	13
C3.	2nd Gen.	4	4	17	12	38	75	15	11	13
C4.	2nd Gen.	4	4	17	11	35	74	15	10	13
C5.	2nd Gen.	4	4	17	12	40	77	17	13	15
D1.	1st Gen.	4	4	16	11	38	73	16	11	14
D2.	1st Gen.	4	4	17	12	40	77	17	13	15
B1.	2nd Gen.	4	4	17	11	32	68	15	11	14
D1.	1st Gen.	4	4	18	12	42	80	17	12	15
D1.	2nd Gen.	3·5	3·5	16	11	35	69	14	11	13
D2.	2nd Gen.	4	4	17	11	33	69	15	13	14
D3.	2nd Gen.	4	3	17	11	35	70	15	11	13
D4.	2nd Gen.	3	3	17	11	36	70	16	11	13
D5.	2nd Gen.	4	4	17	11	36	72	15	10	13
Average .		3·7	3·7	16·8	11·3	36·4	71·7	15·4	11·2	13·5

13. CHANGES IN COLORATION.

Spec.	Newly-hatched.	After 1st Ecdysis.	After 2nd Ecdysis.	After 3rd Ecdysis.	If a Change later.
B1.	Not recorded.	Pale yellowish-green.	Unchanged.	Unchanged.	Yes.
B2.	Not recorded.	Not recorded.	Dark brown with greenish tinge.	Darker, no green tinge.	Yes.
C1.	Pale dirty green.	Unchanged.	Unchanged.	Grey, with pink tinge and speckled with bluish-black.	Yes.
E1.	Pale green.	Not recorded. Probably unchanged.	Not recorded. Probably unchanged.	Abdomen with a dark lateral stripe.	No.
E2.	Pale greenish-yellow mottled with brown.	More greenish.	Pale ochreous.	A little darker.	Yes.
D1.	Pale green.	Yellowish-green.	Yellowish-green with black speckling.	Dark green mottled with brown.	Yes.
D2.	Not recorded.	Pale green.	Not recorded.	Ochreous.	Yes.

14. COLORATION AT THE FINAL STAGE.

Illustrating Variation in same Generation.

Parent.	Colour of Parent.	Offspring of 1st Gen.		Period over which Colour has changed in 1st Gen.	Offspring of 2nd Gen.	
B.	Earth-brown. A dorsal patch of pale buff on 4th abdominal segment.	Specs. 1	Green.	8 months.	Specs. 1 to 10	Green.
		2	Nearly black; abdomen with pale lateral stripe.	10 months.	11	Green, speckled brown.
					12, 13	Darker green.
C.	Green.	1	Pale ochreous with pink tinge and speckled black.	16 months.	1	Pale green above. Pale yellowish-brown below.
					2 to 5	Pale ochreous tinged with green.
D.	Green. Abdomen nearly smooth.	1	Nearly black with greenish and yellowish mottlings.	11½ months.	1 to 8	Yellowish-green.
		2	Dark ochreous.	16 months.	9	Dark green.
		3	Yellowish-green.			
		4	Dark green.			
E.	Dark green.	1	Pale green.	16 months.	1 to 8	Light green.
		2	Earth-brown. Abdomen a little paler than head and thorax.	15½ months.	9	Pale ochreous.

15. SUMMARY OF TABLES.

Incubation.	Average period.		247 days.
	Variation in range of two or more eggs deposited in 24 hours.		1–16 days.
Ecdyses.	Average period between	Hatching and 1st ecdysis.	86 days.
		1st and 2nd ecdysis.	34 days.
		2nd and 3rd ecdysis.	40 days.
	Average age at	3rd ecdysis.	152 days.
		4th ecdysis.	166 days.
Oviposition.	Average period.		330 days.
	Average number of eggs.		366.
	Average number of eggs during	First 20 days.	37.
		First 2 months.	One per day.
		Second 3 months.	One in 2 days.
Post-embryonic development.	Average time between 3rd ecdysis and oviposition.		40 days.
	Period of post-embryonic development.		202 days.
Longevity.	Average age reached.		501 days.
Rate of growth.	1st ecdysis.	Average age.	39·7 days.
		Average length.	26·3 mm.
	2nd ecdysis.	Average age.	68 days.
		Average length.	35·5 mm.
	3rd ecdysis.	Average age.	115 days.
		Average length.	59 mm.
	Average increase between	1st and 2nd ecdysis.	9·1 mm.
		2nd and 3rd ecdysis.	21·1 mm.
	Average maximum length reached.		75·8 mm.
	Average age at maximum length.		261 days.
Average measurements at maximum growth.	Head.		3·7 mm.
	Prothorax.		3·7 mm.
	Mesothorax.		16·8 mm.
	Metathorax.		11·3 mm.
	Abdomen.		36·4 mm.
	Total length.		71·7 mm.
	Femora.	Anterior.	15·4 mm.
		Intermediate.	11·2 mm.
		Posterior.	13·5 mm.

16. The Reconstruction of a Lost Limb.

Having read that Stick Insects are capable of growing a new limb in the event of one being lost under certain conditions, I made the following experiment :—

Posterior right leg removed at trochanter when 1 *day old.*

Age 28 days.—A miniature limb has developed in place of the lost one. It is about a third the size of normal, and is almost colourless.

Age 45 days.—The new limb is about two-thirds the size of normal. The fourth tarsal segment is rudimentary.

Age 62 days.—Upon completion of first ecdysis.—There is no apparent change in the form of the new limb.

No further experiments were made, but there is room for much more work on this subject.

17. Simulation of Death in the Newly-hatched.

On several occasions, upon removing cover from boxes in which insects had hatched a few hours previously, they were seen to draw up the legs and antennae and instantly assume the characteristic attitude of an adult specimen.

18. Mortality.

A certain proportion of individuals in any batch hatched always died at an early stage from no apparent cause. A few would show abdominal malformations after attaining maturity, and such individuals were not usually long-lived.

Mortality from unknown causes was exhibited in batches reared in the same cage or box. This pointed to some inherent weakness in the individual, a factor of probable importance in reducing the numbers of many species of insects. The insect may be less resistant to the attacks of bacteria and more sensitive to changes of temperature, etc.

19. Variation and Parthenogenesis.

The high degree of protective resemblance exhibited by Stick Insects is probably the result of severe competition in the struggle for existence. A further protection is given to the species by the power of parthenogenetic reproduction.

The great degree of variation shown to exist in these

insects has rendered possible their protective coloration and instincts. This may be ancestral to the parthenogenetic condition, which would seem to have been developed in response to continued competition. This would suggest that the immunity obtained through instinct and coloration was at some period weakened by the introduction of another destructive factor in the environment.

20. Inheritance of Variability.

In the various factors dealt with in the preceding tables, the offspring may differ widely from the parent in one or two generations. Neither do the individuals of one generation exhibit any agreement in these factors, except in the case of size, which is fairly constant throughout, and probably of specific peculiarity.

July 26, 1920.

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OF THE

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OF

LONDON

1920.

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XII. *A Contribution towards the knowledge of the Anthomyid genera* Hammomyia *and* Hylephila *of Rondani* (*Diptera*). By J. E. Collin.

[Read June 2nd, 1920.]

Plates VII—X.

In the *Hylemyia-Chortophila* section of the Anthomyidae, which includes the only too well-known "Onion-fly" and "Cabbage-Root-fly," the larvae are principally vegetable feeders; but there exists in that section a small group of species the life-history of which is intimately connected with that of various Hymenoptera—usually of the family Andrenidae. The female flies haunt the neighbourhood of the burrows which the bees make use of for breeding purposes, and, so far as is known, the larvae of the flies live upon the pollen-masses stored by the bees.

This group of flies are principally distinguished by their having a very "buccate" head with broad facial orbits (genae) and jowls (buccae), and the eyes of the females seldom very widely separated on the frons—often almost as approximated as in the males. A more complete diagnosis would be as follows :—

Eyes bare, often only very narrowly separated on the frons *in both sexes*, never very widely separated in the male, and when the frons is wide in the female, the frontalia are narrow (not wider than the frontal orbits) and without strong crossed bristles. Facial orbits and jowls wide, often very wide, giving the head a "buccate" appearance. Arista almost bare, distinctly pubescent, or rarely (*grisea*) plumose. Thorax without conspicuous dull black markings, and scutellum without dark patches at the sides. Two pairs of presutural dorsocentral bristles. Strong sternopleural bristles arranged 1 : 2 (male), or 1 : 1 (female),—never 2 : 2. Abdomen with more or less conspicuous tessellated markings and central brown stripe. Hind-marginal bristles strong and conspicuous. Male hypopygium not swollen or projecting dorsally above the level of abdomen. Penis often much flattened, and always with a chitinous strip each side ending in a pointed process. Projections of the last male sternite not very conspicuous and never shining black

or highly chitinised. Legs in Palaearctic species never partly yellow. Ungues and pulvilli long in the male, but never so in the female. Female front tarsi never dilated. Wings with the anal vein continued, even if faintly, to the wing-margin, and costa extending to end of discal vein. Practically no distinct spines at mediastinal break in costa. Postical cross-vein usually distinctly oblique and often sinuate. Radial and cubital veins sometimes slightly converging towards the tip. Thoracal squamae never very conspicuously larger than the alar squamae, often much smaller.

The two genera into which this group is at present divided may be distinguished as follows :—

1. (2) Arista distinctly pubescent or even plumose. Females with eyes widely separated and true orbital bristles present (even if small), the front pair pointing forwards. *Hammomyia* Rond.
2. (1) Arista bare or microscopically pubescent. Females with eyes approximated as in the males, or if somewhat separated, the orbital bristles absent. *Hylephila* Rond.

Hylemyia grisea Fln., and *Chortophila albescens* Zett., of the British List belong to the first genus. *Chortophila buccata* Fln., and *unilineata* Zett., to the second. Outside Europe species of both genera are known to occur in North and South America.

The species of *Hylephila* are superficially remarkably alike, and consequently mistakes in identification have been frequent. Further confusion has been caused by the females having been mistaken for males owing to the similar approximation of the eyes on the frons in both sexes. The most certain method of identifying the males is by an examination of the genital organs, and Schnabl must be given the credit for being the first to illustrate the remarkable specific differences exhibited by these organs. Unfortunately in some cases his identifications were wrong, while his figures fail to give a good idea of the excellent characters to be found in the structure of the aedeagus. To remedy this defect fresh figures have been prepared, and the writer has pleasure in gratefully acknowledging the help he has received from Dr. J. Villeneuve of Rambouillet in the loan and gift of specimens for this purpose.

HAMMOMYIA * Rondani, Dipt. Ital. Prodr. vi, 236 (1877).

TABLE OF SPECIES.

1. (2) Arista plumose. Only one strong supra-alar bristle over root of wing (pre-alar bristle absent). . . 1. *grisea* Fln.
2. (1) Arista pubescent. Two strong supra-alar bristles (pre-alar bristle present).
3. (4) *Male* :—Grey, with at most a very faint brown median stripe on thorax. *Female* :—Frons rather narrower (compared with width of head as 25 : 100). . 2. *albescens* Zett.
4. (3) *Male* :—Much darker and with a distinctly 3–5 striped thorax. *Female* :—Resembling *albescens* but frons rather wider (compared with width of head as 30 : 100).
3. *sociata* Meig.

1. **H. grisea** Fallén, Dipt. Suec. Musc. 57 (1823).
(Plate VII, fig. 1.)

This large greyish species is easily recognised by the characters given in the Table.

♂. Ocellar and frontal bristles long and strong. Only a single row of bristles along oral margins. Thorax with a distinct brownish central stripe and a brown patch behind humeri and usually one on centre of scutellum at base. Abdomen inconspicuously tessellated and with a central brown stripe and slightly brownish hind-margins to segments. Hind-marginal bristles very strong. Sternopleura with a shorter finer bristle beneath both the usual strong front and hind bristles. Hind femora with a complete anteroventral row of bristles and a posteroventral row on apical half or more. Front tibiae with a strong posteroventral bristle. No bristle beneath middle tibiae. Hind tibiae with 3–4 short strong bristles behind. Wings with the postical cross-vein rather sinuate and somewhat oblique.

♀. Frons wide, almost $\frac{1}{3}$ the width of head. Orbital bristles stronger than in any other species of the genus, two pointing forwards and a smaller upper one pointing backwards and slightly outwards. Chaetotaxy of legs as in the male but no posteroventral bristles on hind femora and the bristles of anteroventral row less conspicuous. No bristles behind hind tibiae.

Length 5·5–8 mm.

* Stein has recently used the emended name of *Ammomyia* for this genus. Even if the use of the aspirate be incorrect, the inconvenience caused by the alteration of the initial letter appears to warrant the retention of the name as originally written by Rondani.

H. grisea is not a common species in Britain. Specimens have been examined captured during July and August, at Studland (Dorset), by the late Mr. Verrall; in the New Forest (Hants) by Dr. D. Sharp, Mr. C. G. Lamb and Mr. A. H. Hamm; at Golspie (Sutherland), and Waterville in Ireland, by Col. J. W. Yerbury. There is also a specimen in the Cambridge University Museum from Aberfoyle (Perthshire). Miss L. H. Huie has recorded it from Scotland, and fully described its life-history in the "Scottish Naturalist" for January 1916, pp. 13–20. The eggs are laid on the floor of the burrows of *Andrena analis* near the exit. The female fly, after watching for a bee laden with pollen, follows it to its burrow, and waits near the mouth until the bee has left, when, after a hasty examination, the fly backs into the burrow and lays an egg. The grub when hatched lives on the pollen mass in the burrow. There is only one generation in the year, the winter being passed in the pupal stage.

Mr. A. H. Hamm found this species in the New Forest about the burrows of the Andrenid, *Panurgus calcaratus* Scop., and the fossorial wasp, *Cerceris arenaria* L.

Previously considered a *Hylemyia*, this species was first correctly placed in the genus *Hammomyia* by Schnabl.

2. **H. albescens** Zetterstedt, Dipt. Scand. iv, 1520 (1845). (Plate VII, fig. 3.)

♂. Frons about $2\frac{1}{2}$ times the width of third antennal joint. Orbits and frontalia silvery grey in most lights. Vertical and ocellar bristles fine and hairlike. Upcurved bristles on oral margin in two rows. Thorax dull grey and usually only when viewed from behind with indications (sometimes very faint) of a narrow brown central stripe and broader side stripes from humeri to post-alar calli. A single pair of presutural acrostichal bristles very strong. Pre-alar bristle $\frac{1}{2}$–$\frac{2}{3}$ as long as supra-alar. Abdomen distinctly tessellated and with a narrow dark brownish central stripe, and strong hind-marginal bristles. Hind femora with a complete anteroventral row of bristles, but short-haired posteroventrally. Front tibiae with two bristles behind placed fairly close together. Middle tibiae without a bristle beneath. Hind tibiae with 3–4 short bristles behind. Wings with the postical cross-vein very oblique and slightly undulated.

♀. Much resembling the male. Frons wider—slightly more than half as wide again. All bristles shorter, the upcurved bristles on

oral margin very small and uniserial. Pre-alar bristle shorter. Bristles on legs much less conspicuous; often a tiny bristle above front tibiae on apical third. Mid femora with only 1–2 very short posteroventral bristles near base instead of the 4–5 long ones of male. Hind femora with incomplete anteroventral row of bristles and these short except towards tip. Hind tibiae bare behind.

Length 3·5—6 mm.

H. albescens is more often met with than *H. grisea*. Specimens have been examined for the purpose of this paper from Hampshire, Essex. Suffolk, Cambs, Norfolk, London and Nottinghamshire, taken in June, July and August. They occur in sandy places in association with Aculeate Hymenoptera. The females are very difficult to distinguish from those of *H. sociata*, and both species occurred together to the late Mr. Verrall at a sandy cutting by Plumstead railway station near Woolwich on July 17th, 1874. Zetterstedt gives *Diodontus pallipes* as the host, and an old note of Mr. Verrall's states that Mr. Charbonnier of Bristol found *H. albescens* * ovipositing in the burrows of *Halictus nitidiusculus*. In Kertesz' Catalogue the name of *albiseta* v. Roser (1840) is used by Stein for this species. In view of the fact that a still older name (*cinerea* Desv. 1830) is quoted as a synonym in the same Catalogue, which so far as the descriptions are concerned appears to have as much right to be used as that of von Roser, it is not proposed to discontinue the use in the British List of Zetterstedt's well-known name.

3. **H. sociata** Meigen, Beschr. Eur. Dipt. v, 98 (1826).

Syn. *gallica* Schnbl. and Dzied., Nova Acta, xcv, 236 and 355 (1911).

(Plate VII, fig. 2.)

♂. Eyes very narrowly separated on frons by the narrow orbits and frontal stripe. Head in profile with a projecting frons, the facial orbits opposite base of antennae very wide but rapidly narrowing below. Face short and slightly retreating. Jowls with numerous upcurved bristles above oral margin in many rows. Lower part of occiput considerably inflated. The silvery frontal, and upper part of facial, orbits with distinct blackish reflections in some lights. Thorax brownish-grey with (in some lights) five

* The possibility that Charbonnier's specimens might have been the next species (*sociata*) must not be overlooked.

blackish stripes, the side stripes being broad, but they all vary according to the point of view, and when viewed from behind the intermediate stripes disappear. Scutellum also with shifting dark tessellations. Behind the humeri there are other bristles in addition to the usual intrahumeral and presutural, notably a very strong (? true posthumeral) bristle nearer the notopleural depression. Pre-alar bristle long and distinct. A pair of presutural acrostichal bristles much stronger than the others. Often a third shorter finer bristle below the usual two posterior sternopleural bristles. Abdomen light brownish- (almost yellowish-) grey, with a narrow dark central stripe. Tessellations not conspicuous, but in some lights a distinct darkening about sutures. Front femora rather densely long-haired behind; front tibiae with two bristles behind on apical half. Middle tibiae with no bristle beneath. Hind femora with a complete anteroventral row of long bristles and with 2–4 similar or even longer bristles posteroventrally on basal half; hind tibiae with 2–3 short bristly hairs behind. In other respects the chaetotaxy is as usual in this group. Wings absolutely without costal spine; cubital and discal veins slightly converging except at their extreme tips; postical cross-vein very oblique and remarkably sinuate. Squamae (subequal) and halteres yellow.

♀. Differing completely in colour from the male, being grey and remarkably like the female of *albescens*. The frons is always slightly wider, being $\frac{2}{10}$ the width of the head and approximately $\frac{1}{5}$ wider than in *albescens*. Palpi narrower at the base and more distinctly dilated and flattened about middle and more pointed towards tip than in *albescens*. The thorax is rather more distinctly striped, the middle stripe appearing in some lights to split up into two closely approximated dark lines. The abdominal stripe may almost disappear when viewed in certain lights—much more so than in *albescens*.

Length 6–7 mm.

H. sociata is here for the first time introduced as British on five females (two in the British Museum and three in the writer's Collection), after a close comparison with Continental specimens kindly supplied by Dr. Villeneuve, who has taken both sexes near Rambouillet (Seine-et-Oise). Four of the British specimens were captured by the late Mr. Verrall close to Plumstead railway station near Woolwich, in company with *H. albescens*, on July 17th, 1874; the fifth is an old specimen from Dossiter's Collection without locality. Though there is little doubt

concerning the identity of these specimens, it is to be hoped that these notes will lead to the discovery of the male in this country.

This species stands in Kertesz' Catalogue under the genus *Hydrophoria*, but it has since (1916) been correctly placed by Stein in *Hammomyia*. It is possible that Pandelle's *H. ciliosa* may prove to be a synonym.

HYLEPHILA * Rondani, Dipt. Ital. Prodr. vi, 233 (1877).

TABLE OF SPECIES.

Males.

1. (10) Middle tibiae with a bristle beneath, or (*unilineata*) somewhat anteroventral.
2. (7) More hairy species. Posterior femora with numerous long fine hairs beneath.
3. (4) Bristle beneath middle tibiae smaller and placed more anteroventrally. . . . . 1. *unilineata* Zett.
4. (3) Bristle beneath middle tibiae stronger and distinctly ventral.
5. (6) Thorax viewed from the side with 3–5 fairly conspicuous darker stripes, and with the pubescence (as distinct from bristles) long and dense. Middle femora more densely haired behind. . . . . 2. *obtusa* Zett.
6. (5) Thorax viewed from the side with an inconspicuous middle stripe only, and the pubescence shorter and less dense. Middle femora not so densely haired behind.
   3. *dissimilis* Villen.
7. (2) Less hairy species. Posterior femora more bristly than hairy. Hind femora with antero- and postero-ventral rows of stouter bristles.
8. (9) Thorax seldom with any indication of a central dark stripe. Hind tibiae with only 2–3 short inconspicuous bristly hairs behind. Postical cross-vein more sinuous.
   4. *personata* n.n.
9. (8) Thorax with a brown central stripe. Hind tibiae with 7–8 longer finer bristly hairs behind. Pre-alar bristle shorter and finer. Postical cross-vein straighter.
   5. *unistriata* Zett.
10. (1) Middle tibiae without a bristle beneath.

* It has been suggested that this name is preoccupied in the Lepidoptera (Enum. Ins. in Mus. G. J. Billberg, 1820, p. 81). Billberg's names, however, cannot be considered valid genonyms (*v.* Walsingham and Durrant, Ent. M. Mag. 1902, pp. 163–170), so Rondani's name can stand.

11. (16) Pre-alar bristle present even if short. Only 1–2 rows of upcurved bristles along oral margin of jowls.
12. (15) Weakly bristled species. Head bristles short; very few bristles along oral margins. Ungues and pulvilli comparatively short. Hind tibiae with only 2–3 short bristly hairs behind.
13. (14) Arista practically bare. Abdominal stripe wider. Prosternal plate (between front coxae) bare or with a pair of short hairs only. . . . . 6. *brevifrons* Stein.
14. (13) Arista pubescent. Abdominal stripe very narrow. Prosternal plate with a pair of strong bristles.
7. *buccata* Fln.
15. (12) Strongly bristled species. Prosternal plate bare. Ungues and pulvilli long. Hind tibiae with a ciliation of 8–10 bristly hairs behind. . . . . 8. *sponsa* Meig.
16. (11) Pre-alar bristle absent. Small, light dove-grey species with many rows of upcurved bristles on jowls.
9. *dorsalis* Stein.

Females.

1. (10) Middle tibiae with a bristle beneath, or (*unilineata*) more anteroventral.
2. (3) Frons wider; at narrowest part more than $\frac{1}{3}$ the width of head. Bristle beneath middle tibiae small and placed more anteroventrally. . . . . 1. *unilineata* Zett.
3. (2) Frons narrower; at narrowest part much less than $\frac{1}{3}$ the width of head. Bristle beneath middle tibia distinctly ventral.
4. (7) Front tibiae with two bristles behind.
5. (6) Scutellum more densely hairy. Two distinct pre-apical bristles to front tibia. Postical cross-vein longer.
2. *obtusa* Zett.
6. (5) Scutellum less hairy at sides and bare about middle. Only one distinct pre-apical bristle to front tibia. Postical cross-vein shorter. . . . . 3. *dissimilis* Villen.
7. (4) Front tibiae with only one bristle behind.
8. (9) Pre-alar bristle strong though only about half the length of supra-alar. Postical cross-vein oblique. The middle four bristles on hind-margin of last visible abdominal segment much further from the margin than the others.
4. *personata* n.n.
9. (8) Pre-alar bristle very short and fine. Postical cross-vein more upright. Bristles on hind-margin of last abdominal segment all equally near margin. . 5. *unistriata* Zett.

10. (1) Middle tibiae without a bristle beneath.
11. (16) Pre-alar bristle present even if short.
12. (15) Hind-margin of sixth abdominal segment with long strong curved bristles, which are bent down over the end of abdomen when the ovipositor is withdrawn.
13. (14) Arista practically bare. Abdominal stripe more distinct. Prosternal plate usually quite bare. 6. *brevifrons* Stein.
14. (13) Arista pubescent. Abdominal stripe narrower. Prosternal plate with a pair of strong bristles. . 7. *buccata* Fln.
15. (12) Sixth abdominal segment with no remarkable curved bristles. Frons wider (about ¼ the width of head). Postical cross-vein oblique and somewhat sinuate. 8. *sponsa* Meig.
16. (11) Pre-alar bristle absent. . . . . 9. *dorsalis* Stein.

1. **Hy. unilineata** Zetterstedt, Ins. Lapp. 675 (1838); D. Scand. iv, 1518 (1845).

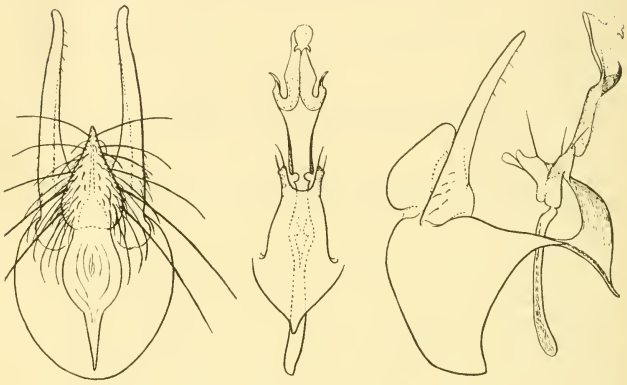
Resembling the next two species, but greyer and easily distinguished by having the bristle beneath middle tibiae smaller and placed more anteroventrally.

♂. Head very much as in *obtusa*. Thorax greyer, with a faint brownish central stripe continued over scutellum and an indistinct brownish stripe on each side; viewed from behind the thorax appears darker grey but not so dark as in *obtusa*. Acrostichals long but fine, the other fine hairs on thorax and scutellum (as distinct from bristles) less numerous than in *obtusa*. Pre-alar bristle distinct but hardly half the length of supra-alar bristle. Abdomen grey but distinctly tessellated with shifting dark tessellations and a central dark stripe; conspicuously pilose and with strong hind-marginal bristles. The genitalia are quite distinctive; the end of the penis showing some approach to the remarkable development in *dissimilis*, while the narrow side-lamellae more resemble those of *sponsa*.

Legs as in *obtusa* with the femora more pilose than setose, especially the middle femora with rather dense fringes of long fine bristly hairs posteroventrally. On middle tibiae the antero- and postero-dorsal spines at apical third are stronger than in *obtusa*, while the strong absolutely ventral bristle of *obtusa* is represented by a shorter, distinctly more anteroventral bristle. Hind legs, wings, etc., very much as in *obtusa*.

♀. Distinguished at once by the wide frons—almost as wide as in *sponsa*—and the short anteroventral bristle to middle tibiae. Width

of frons compared with width of head as about 22 : 100; frontal stripe about double as wide in front as at narrowest part; frontal bristles numerous (10–11 pairs); long, upcurved bristles on jowls much less numerous than in the male or in *obtusa* ♀. Thorax very inconspicuously striped but brownish about middle and on indistinct stripes or patches, which however vary considerably in colour according to the point of view. Abdomen whitish-grey with a brown central stripe and distinct brownish tessellations which remain more or less visible about base of segments from most points of view. Bristles on hind-margin of last visible segment weak. Legs much



Details of male genitalia of *H. unilineata* Zett. × 33.

as in *obtusa* ♀ except for the more anteroventral, instead of ventral, bristle to middle tibiae. Wings often with the veins faintly clouded with yellowish-brown.

Length 6–8 mm.

Under this species in Zetterstedt's Dipt. Scand. Collection there are four males and three females; two of the males (one with locality label "*Kjellby*") are *H. sponsa*; the other two males (one with label "*Ernaes*" and the other "*Lapp.*") and three females (one with label "*Ernaes*") belong to the species described above. In the collection at Stockholm under *unilineata* there are a pair of *obtusa*, a male of *sponsa*, and one male and five females of the species described above; a pair of these latter bear a label "Zett."

and, by kind permission of Prof. Sjöstedt, figures of the genitalia were made from the male so labelled. Zetterstedt's original description of *unilineata* applies best to the species described above, and his name must be so used in spite of the fact that such a limitation of the name is not in agreement with the views of recent writers. Stein's *unilineata* (Arch. f. Nat. lxxxi, 1916, p. 162) appears to be *obtusa* Zett., while according to the figures of the male genitalia of Schnabl and Dziedzicki's *unilineata* in "Die Anthomyiden" (1911) their specimen must have been *unistriata* Zett.

H. unilineata is at present known from Sweden only. Meade certainly added the name to the British List in 1882 (Ent. M. Mag. xix, 146), but his specimens were more probably *H. sponsa*. The name *unilineata* has also been used for *personata* by Verrall.

2. **Hy. obtusa** Zetterstedt, Ins. Lapp. 682 (1838); D. Scand. iv, 1571 (1845).

Syn. *unilineata* Stein (*nec* Zett.), Arch. f. Nat. lxxxi, 162 (1916). ? *buccata* Schnbl. and Dzied. (*nec* Fln.), Nova Acta, xcv, Pl. 5, figs. 81, 82 (1911).

(Plate VIII, fig. 5).

♂. Darker and more hairy than the male of any other British species. Compared with *personata* all the hairs and bristles are much longer, and there are longer and more numerous upcurved bristles along the oral margin on the jowls, and conspicuously longer and more numerous fine hairs (as distinct from the bristles) on the thorax. Disc of thorax distinctly darker, and, when viewed from the side or behind, with indications of five darker stripes, of which the three inner ones follow the lines of the acrostichal and dorsocentral bristles, the broader side stripes being most distinct above the root of wing; viewed right from in front the whole thorax appears distinctly greyer. Abdomen less distinctly tessellated, though all markings vary according to the point of view; on the whole, however, there is a stronger tendency to darker hind-margins to segments than in *personata*. Legs much more hairy and with less distinction on the femora between the hairs and bristles. Hind coxae densely clothed in front with curved fine hairs. Front femora densely long-haired on the whole of the posterior surface, the posterodorsal and posteroventral rows of bristles very little differentiated; middle femora with no long anteroventral ciliation but with a

posteroventral fringe of long bristly hairs as compared with the row of bristles in *personata*; similarly the hind femora have an anteroventral fringe of long bristly hairs among which some stronger bristles may be distinguished towards the tip, and numerous posteroventral long fine hairs, besides being distinctly pilose in front and (to a less extent) behind. Tibiae with the pubescence (as distinct from strong bristles) longer than in *personata*; front tibiae with two to three long fine posteroventral bristly hairs; middle tibiae also with the usual bristles as well as the pubescence longer and finer; hind tibiae with an anteroventral row of bristly hairs ending in a strong bristle towards tip, as compared with the three to four short bristles of *personata*; and with a fringe of long bristly hairs on the middle third behind. Pulvilli and ungues very long. Wings very much as in *personata*; postical cross-vein sloping and somewhat sinuous, in neither perhaps quite so much as in *personata*. Alar squamae distinctly larger than thoracal and as in *personata* with a longer fringe, whereas in *buccata* the fringes on the two squamae (except as in all cases about the angle between them) are much more equal in length.

♀. The differences between this species and *personata* are much less marked in the female sex. It is, however, normally darker—more brownish-grey—with the tomentum on cheeks and jowls usually more yellowish-grey instead of silvery-grey, a distinct central stripe on thorax, and with decided indications of darker hind-margins to abdominal segments. An important distinction lies in the arrangement of the bristles on the hind-margin of the last visible (external) segment of the abdomen; in the present species they are strong stout bristles and the middle four are, like the others, placed close to the hind-margin; in *personata* they are not so strong and the middle four are placed a considerable distance from the hind-margin, especially the middle pair. Front tibiae more usually with two posteroventral bristles, one at about middle and the other nearer the tip, hind femora with about ten anteroventral bristles strongest towards tip, and no distinct posteroventral bristles.

Length 6–8 mm.

H. obtusa is probably not rare in Britain. The late Mr. Verrall caught a male at Darenth (Kent) on April 8th, 1870, and had also taken a female in his brother's garden at Denmark Hill, London, on April 26th, 1868. Col. Yerbury caught two females at Charlton (Kent) on April 15th, 1897, while Col. S. Monckton Copeman found the females in numbers round the burrows of *Andrena fulva* at Primrose Hill, London, N.W., in May 1919. Two males and two

females have been examined taken in Nottinghamshire in May and early June by Prof. J. W. Carr and Dr. Hunter, and a very grey female was taken by Mr. C. G. Lamb in the New Forest in July 1902. The name is new to the British List.

The single type specimen of *H. obtusa* in Zetterstedt's Collection is a female, and not a male as Zetterstedt described it. This is unfortunate, because the females are much more difficult to identify than the males. One point is quite certain—it is not the female of the *obtusa* of Stein and Schnabl (a species which is renamed *personata* in the following pages). The type specimen is smaller and greyer than British *obtusa* as described above, but has the same short but fairly strong pre-alar bristle, a distinct central stripe on thorax, a tessellated abdomen with *strong* bristles on the hind-margin of last visible segment (all near the margin), and postical cross-vein somewhat sloping and sinuate; the front tibiae, however, bear only one bristle behind instead of the usual two. Specimens identical with British *obtusa* certainly occur in Sweden, such being present in the Collection at Stockholm and in Ringdahl's Collection; moreover Ringdahl had named his specimens *obtusa* after an examination of Zetterstedt's type. Schnabl and Dziedzicki appear to have figured the male genitalia of this species as that of *buccata*, while the *H. jankowskii* described in the same work, "Die Anthomyiden," 1911, must be very closely allied.

3. **Hy. dissimilis** Villeneuve, Ent. Mo. Mag. 1920, p. 227. (Plate VIII, fig. 6.)

♂. Much resembling *obtusa*, but distinguished by the characters given in the Table of Species and by the very different genitalia. The comparison of longer series of specimens will probably reveal other characters. It would appear to be usually smaller, and distinctly less hairy, especially the long hairs (as distinct from bristles) on the scutellum and along the sides of the thorax above the notopleural depression, are less numerous than in *obtusa*. The hairs behind front femora are rather shorter and consequently more differentiated from the rows of bristles. The hind tibiae bear only 4–5 shorter bristly hairs behind.

♀. Very similar to *obtusa* having two bristles behind front tibiae but only one distinct pre-apical bristle to those tibiae. Discal cell narrower at end, the postical cross-vein closing the cell being shorter,

scutellum less hairy, being bare about the middle of disc and with only a few hairs about the sides.

Length 5–8 mm.

H. dissimilis is at present known from only France and Algiers. Specimens in Dr. Villeneuve's Collection taken at Mascara. Algiers, in March and April, have been compared with French specimens and found to be identical.

4. **Hy. personata** n.n.

Syn. *obtusa* Stein (*nec* Zett.), Arch. f. Nat. lxxxi, 162 (1916). Schnabl and Dzied., Nova Acta, xcv, Pl. 5, figs. 85, 86 (1911).

(Plate X, figs. 10, 12, 13.)

♂. Facial orbits rather narrower than in *obtusa*, but jowls quite as deep, consequently in profile the difference between the horizontal and vertical axes of the head is rather greater. The upcurved bristles near oral margin though shorter and less numerous than in *obtusa* are more numerous than in *unistriata*. Thorax appearing almost equally greyish whether viewed from in front or behind, and any indications of darker stripes very difficult to trace. Pre-alar bristle strong, though only about half as long as supra-alar. Abdomen distinctly tessellated except when viewed directly from behind, when all tessellations disappear leaving a sharply differentiated central brown stripe. The colour of rest of abdomen when so viewed is distinctly more yellowish-grey than in *obtusa*. Front femora with posterodorsal and posteroventral rows of long, strong bristles, well differentiated from the finer, long bristly hairs behind. Middle femora posteroventrally with 6–7 long, strong bristles on rather more than basal half only, otherwise comparatively short-haired beneath and behind. Hind femora with a complete anteroventral row of long, strong bristles; posteroventrally with 5–6 finer long bristles on basal half (or rather more) only. Front tibiae with only one posteroventral bristle; middle tibiae with one anterodorsal bristle at apical third, one posterodorsal at apical fourth, two posteroventral, the lower one at apical fourth, the upper one (which is really a posterior rather than a posteroventral bristle) slightly above middle; hind tibiae with three widely-spaced, short, anteroventral bristles, the lowest one very little longer than the other two, 2–3 anterodorsal, 3 posterodorsal—the lower one very long, much longer than the upper and longer than the middle one, and 2–3 very short fine bristles behind just above middle—only a little longer than other pubescence but more outstanding, very

similar to those in *buccata*. Wings with postical cross-vein very sloping and sinuous.

♀. For the chief distinctions between this species and *obtusa* see description of the female of the latter. Hind femora with usually only seven anteroventral bristles and with distinct posteroventral bristly hairs towards base. Hind tibiae as in the females of all species without any distinct bristles behind.

Length 5·5–8 mm.

H. personata appears to be the most common and widely distributed species of the genus in Britain. It stood under the name *unilineata* in Verrall's Collection and has undoubtedly often been mistaken for that species and for *H. buccata*. Specimens have been taken at Cuckmere (Sussex), near Dunsford (Devon) and Newmarket and Barton Mills (Suffolk) by the late Mr. Verrall; at Shoeburyness (Essex) and Wendover (Buckingham) by Col. Yerbury; at Seaton (Devon) by the Rev. A. E. Eaton; in and near Oxford by Mr. A. H. Hamm; and at Long Sutton (Hants). All captures took place in May and June. In addition Col. Yerbury found a female at Hyères (S. of France) on March 19th, 1898, and there was a single male in Kowarz's Collection under the name *unilineata* Zett. taken in Corfu. It also occurs in Sweden, males having been examined from Ringdahl's Collection and a single female in Zetterstedt's Dipt. Scand. Collection under *buccata*.

With regard to the habits of this species, Mr. Hamm caught two females following *Andrena labialis* at Boar's Hill, Brickfield, near Bagley Wood, Oxford (*v.* Proc. Ent. Soc. Lond. 1906, p. xiii); four females at University Parks, Oxford, following *Andrena nigroaeneus*; and two females at Open Brasenose Common, near Oxford, with *Andrena labialis*—one of them captured after having entered the burrow of the bee. There is also a female in the B.M. from the Verrall Collection labelled "Margate, v. 05, shadowing *Andrena trimmerana*."

5. **Hy. unistriata** Zetterstedt, Ins. Lapp. 677 (1838); D. Scand. iv, 1512 (1845).

Syn. *unilineata* Schnabl and Dzied. (*nec* Zett.), Nova Acta, xcv, Pl. 5, figs. 79, 80 (1911). ? *inflata* Stein p.p. (*nec* Rond.), Arch. f. Nat. lxxxi, 161 (1916).

(Plate X, fig. 11.)

Superficially resembling *H. personata*, but thorax with a

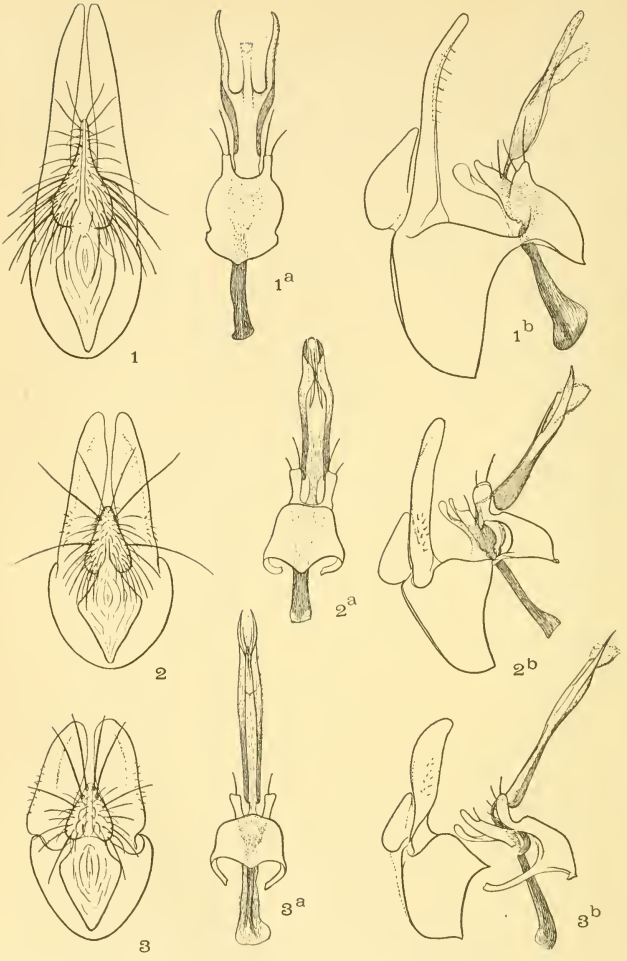
central brown stripe, pre-alar bristle shorter and finer, abdomen less distinctly tessellated, and wings with postical cross-vein more upright.

♂. Head in profile with rather smaller eyes than in *personata*, and these also rather narrower on the upper part with a consequent slight modification of shape of frons when viewed from above; thus the narrowest part of frons is nearer the ocellar triangle and extends for a less distance. Fronto-orbital bristles, bristles on vibrissal ridges and upcurved bristles on oral margin, all less numerous. Thorax somewhat yellowish-grey with an ill-defined central brownish stripe; tip of scutellum brownish. Acrostichals finer; only two strong bristles on front part of thorax behind humeri and between presutural dorsocentrals and notopleural depression, whereas in *personata* there are 3–4; the missing bristle being the outer one immediately behind humerus (? true posthumeral); a strong intrahumeral and presutural still present. Pre-alar bristle shorter and finer (only slightly differentiated from the usual short bristly hairs of disc). Prosternal plate between front coxae usually but not invariably bearing a few small bristles. Abdomen much less distinctly tessellated, and with the central brown stripe visible from any point of view, whereas in *personata* with a certain incidence of the light the stripe may even appear greyish. Legs rather more distinctly hairy than in *personata*, but less so than in *obtusa*; chaetotaxy very similar to that of *personata*, thus the hind femora have long distinct posteroventral bristles, especially about middle, but the hind tibiae are rather more strongly bristled with 5–6 anteroventral short bristles, and much longer and more numerous bristly hairs behind just before middle. There are occasionally two bristles behind front tibiae. Wings with a very small but distinct spine at mediastinal break in costa, which is absent in *personata*, and with the postical cross-vein more upright.

♀. (Only a single specimen examined.) Eyes, if anything, very slightly more widely separated than in *personata*; a distinctly smaller number of bristles on oral margin of jowls. Thorax agreeing in characteristics with that of male. Abdomen with a broader, rather ill-defined, central stripe; bristles on hind-margin of last segment strong and all almost equally distant from margin. Chaetotaxy of legs very much as in *personata*. Wings as in the male.

Length 4·5–6·5 mm.

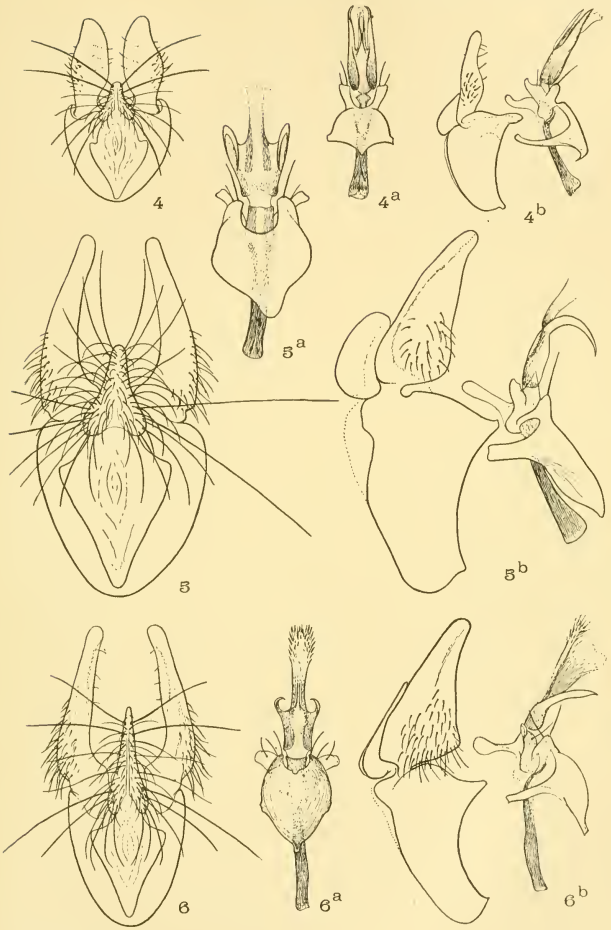
The type of *H. unistriata* in Zetterstedt's Collection is a single male with the hind legs missing, but almost certainly identical with the species described above. There is



J. E. Collin, del.

MALE GENITALIA OF *HAMMOMYIA*.

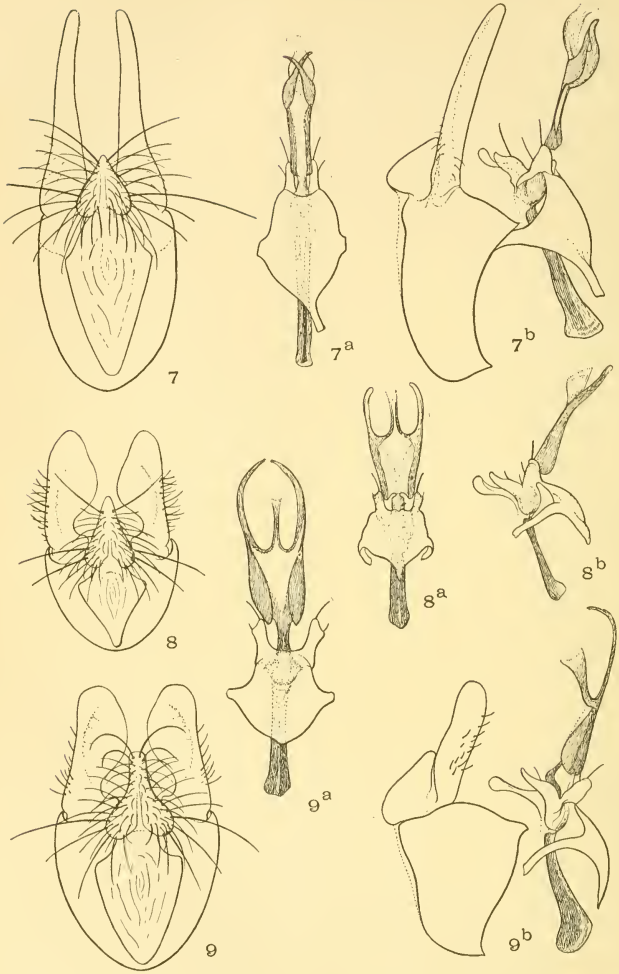
1. *H. grisea.* 2. *H. sociata.* 3. *H. albescens.*



J. E. Collin, del.

MALE GENITALIA OF *HYLEPHILA*.

4. *H. dorsalis.* 5. *H. obtusa.* 6. *H. dissimilis.*



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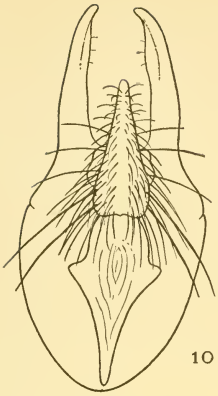
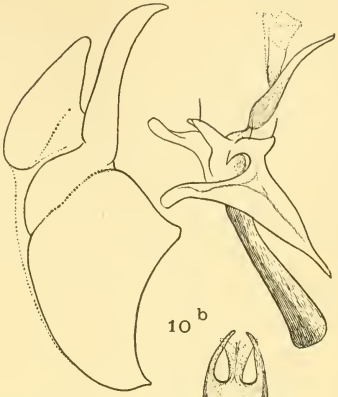
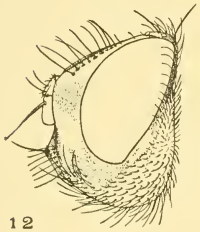
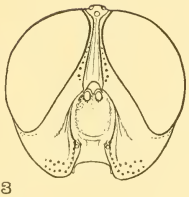
MALE GENITALIA OF *HYLEPHILA*.

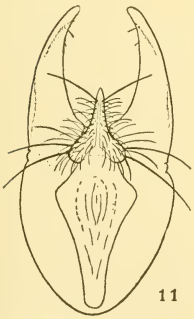
7. *H. sponsa.* 8. *H. brevifrons.* 9. *H. buccata.*

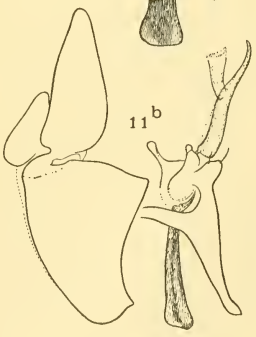












J. E. Collin, del.

MALE GENITALIA OF *HYLEPHILA*.

10. *H. personata.* 11. *H. unistriata.* 12, 13. *H. personata.*

another male in the Collection at Stockholm which is certainly this species.

H. unistriata was present in Kowarz's Collection (8 males labelled "Waldegg" and one male labelled "Asch 1884"), all included by Kowarz under the name *unilineata* Zett. The single female, which is without doubt conspecific with the males, was given to the late Mr. Verrall by Kowarz in 1882 as a female of *H. buccata* and bears no locality label.

The male genitalia agree with the figures of *H. unilineata* Zett. given by Schnabl and Dziedzicki, while the true *unilineata* appears to have been unknown to them. Stein almost certainly included *H. unistriata* under his description of *H. inflata* Rdi. It cannot, however, be Rondani's species because that has the eyes in the female separated by a space almost a third the width of the head (as, for instance, in *sponsa* Meig.).

6. **Hy. brevifrons** Stein, Arch. f. Nat. lxxxi, 159 (1916).
(Plate IX, fig. 8.)

A species very closely allied to *buccata* and best distinguished by the characters given in the Table of Species. In addition the eyes are rather smaller than in *buccata*, more rounded, and slightly more separated on the frons. The silvery jowls distinctly deeper. Wings with the last two sections of discal vein usually less unequal in length. Abdominal sternites distinctly less bristly in the male. Length 5 mm.

H. brevifrons is at present known from only the Col. du Lautaret (Hautes Alpes), where Dr. Villeneuve found it in some numbers in July 1908.

7. **Hy. buccata** Fallén, Dipt. Suec. Musc. 65 (1824).
(Plate IX, fig. 9.)

♂. Head with much shorter bristles than any other British species. Vibrissae and bristly hairs on jowls especially short. Only a single row of bristly hairs on front half of oral margin and no long upcurved bristles. Arista more distinctly pubescent. Thorax without or with a very indistinct central brown stripe. Pubescence, as distinct from bristles, very short and scanty especially in female. Prosternal plate between front coxae with a pair of distinct bristles, one on each side margin. Abdomen without distinct tessellations and with a very narrow central stripe, only

visible as a dark stripe when viewed from behind. Femora with much shorter bristles and bristly hairs; hind femora short-haired posteroventrally. Middle tibiae with no bristle beneath. Hind tibiae with only 1–2 short bristly hairs behind before middle, much as in *personata*. Ungues and pulvilli short. Wings with postical cross-vein oblique but not very sinuate; last section of discal vein at least half as long again as penultimate section. Squamae more equal in size but thoracal projecting beyond alar when wings are folded.

♀. Distinguished from any other British species by the strong pendant bristles at end of the almost hidden *sixth* abdominal segment which intercross over the anal end of abdomen.

Length 5·5–7·5 mm.

H. buccata is apparently rare in Britain. At present only a single male caught by Col. C. G. Nurse at Livermere (Suffolk) on June 29th, 1913, can be recorded, the identity of Dr. Meade's specimens from Silverdale in Lancashire (Ent. M. Mag. xix, 145) being very doubtful, especially in respect of the males.

The above interpretation of Fallén's species agrees with that of Zetterstedt according to the specimens in his Collection at Lund. Meade was the first to record the species as British (v. *supra*); his specimens (whatever they were) were found flying in association with *Andrena albicans* and *A. fulva*. The species has seldom been correctly identified though Stein's species is undoubtedly the same. Strobl, who mentions the presence of "langen aufgerichteten Borstenhaaren" on the jowls, certainly had not the true *buccata* before him. Schnabl and Dziedzicki (Nova Acta, xcv, 1911) figured the male genitalia of *H. obtusa* Zett., as those of this species, and do not appear to have known the true *buccata* at all. The specimens in Kowarz's Collection were correctly named and included a pair from Zetterstedt labelled "Gottlandia" and "Typ. Zett."

8. **Hy. sponsa** Meigen, Beschr. Eur. Dipt. v, 147 (1826).
(Plate IX, fig. 7.)

♂. Eyes rather small and very little more separated on frons than in other males of this genus. Head very silvery-greyish. Fronto-orbital bristles consisting of 6–7 pairs of long bristles on front part leaving a considerable space between the hindermost

and the ocellar triangle, in which space 1–3 pairs of very much smaller bristles may sometimes be found. A few upcurved bristles near the oral margin below the cheeks with some others pointing forwards. Palpi brownish, with few and weak bristles as in *buccata*. Thorax dull grey, slightly darker on disc and lighter on humeri, notopleural depression and pleurae, and with an ill-defined brownish central stripe, and brownish patches at the base of some of the larger bristles, at sides about the suture, and at end of scutellum. As in *unistriata* there is no strong posthumeral bristle; pre-alar bristle short but distinct. Abdomen light grey, more or less conspicuously tessellated, and with a central brown stripe, which when viewed from behind is not sharply defined but varies according to the point of view, and when viewed from the side may completely disappear. Hind-marginal bristles very long and strong. Chaetotaxy of legs very much as in *personata*, but the posteroventral bristles to hind femora are shorter and finer; the hind tibiae are more strongly bristled and bear behind a distinct row of 10–12 short bristles. Wings with yellowish veins; the postical cross-vein somewhat oblique and distinctly sinuous.

♀. Distinguished at once from any other British species by the wide frons (about $\frac{1}{3}$ the width of head). It much resembles the female of *albescens* and *sociata*, but the arista is practically bare and there are no indications of any true orbital bristles. Frontalia of almost equal width throughout; frontal orbits rather wider than frontalia except right above at each side of ocellar triangle. Thorax a little more yellowish-grey than in the male, otherwise very similar. Abdomen the same colour as the thorax, with neither the tessellations nor the central stripe very distinct; hind-marginal bristles not very strong, strongest on fourth segment, those on fifth segment much weaker. Chaetotaxy of legs very much as in *personata* but all bristles rather weaker, no bristle beneath middle tibiae, and bristles of anteroventral row to hind femora most conspicuous towards tip.

Length 7 mm. ♂; 5–6 mm. ♀.

H. sponsa appears to be rather uncommon in Britain. Col. Yerbury caught a male at Llangorse (Brecon) on June 1st, 1899, and Mr. A. H. Hamm a female at Shotover, near Oxford, on June 12th, 1904, when collecting Aculeate Hymenoptera. There is also a female in the Verrall Collection taken in Hayling Island in June 1886, and two old males without history. In the Cambridge University Museum there is a male labelled "New Forest, June 1902, M. A. Sharp." The name is new to the British List.

9. **Hy. dorsalis** Stein, Arch. f. Nat. lxxxi, 160 (1916).
(Plate VIII, fig. 4.)

A very distinct little dove-grey species. There is little to add to Stein's description except that the middle femora posteroventrally bear numerous fine bristly hairs in the place of the single row of distinct bristles in allied species.

Length 4–4·5 mm.

H. dorsalis was found on the Col. du Lautaret (Hautes Alpes) by Dr. Villeneuve, and is also known from Italy.

Hylephila sp !— ? *inflata* Rondani, Dipt. Ital. Prodr. vi, 235 (1877).

Through the kindness of Dr. Villeneuve, it has been possible to examine the unique female specimen which he considers may be the true *inflata* of Rondani. It was caught in the neighbourhood of Rambouillet while in the act of entering the burrow of a Hymenopteron. The absence of any bristle beneath the middle tibiae, the short though distinct pre-alar bristle and the wide frons, make it comparable with only *H. sponsa* Mg. It very closely resembles that species, and, so far as can be judged from a single specimen, only differs in having the postical cross-vein much straighter and only very slightly oblique. The width of frons compared with width of head is as 25·5 : 100—almost exactly the same as in *H. sponsa*.

South American species.

The only species which has been studied is *H. andicola*, Bigot, Ann. Soc. Ent. Fr. (6) iv, 300 (1884). The two specimens from Chile constituting the types belong to two distinct species. The specimen Bigot mistook for a male is a typical female *Hylephila*, and for this specimen the name of *andicola* must be retained. The other specimen is a female *Hammomyia* with subplumose arista, two pairs of true orbital bristles pointing forwards, all the tibiae yellowish, middle tibiae with a very small anteroventral bristle, pre-alar bristle absent, abdomen somewhat compressed towards tip and very truncate, wings with postical cross-vein much straighter.

Hy. andicola Bigot, ♀ (Type) (= *Hylemyia andicola* Bigot, ♂ *nec* ♀).

Frons at narrowest part about twice as wide as third antennal joint. Arista very slightly pubescent. Three or four upcurved bristles on oral margin below cheeks. Thorax with three conspicuous brownish stripes, the other (almost linear) darker stripes down lines of dorsocentral bristles only visible from certain points of view. Pre-alar bristle distinct. Prosternal plate bare. End of abdomen hardly meriting the term "villeux," the last visible segment with the usual hind-marginal bristles—all near the margin —and not particularly strong; the hidden segments with a few bristly hairs on their hind-margins. Ovipositor ending in the usual strong upcurved spines. Only the hind tibiae could be called "rougeâtres." Front tibiae with two bristles behind; middle tibiae with one anterodorsal and one posterodorsal both below middle, one behind at basal third and one more posteroventral opposite posterodorsal bristle. Hind femora with about six anteroventral bristles on apical two-thirds and 1–2 moderately long posteroventral bristly hairs towards base. Hind tibiae with two short anteroventral bristles, 3–4 anterodorsal and 3 posterodorsal—in both cases the third from the base the longest.

Length 6 mm.

General note on the illustrations.

The figures of the male genitalia were made after treatment with KOH, and are all drawn to the same scale (magnified about 33 diameters).

Figs. 1–11 represent the so-called dorsal view of Schnabl and Dziedzicki, though in its natural position with reference to the abdomen of the insect it is more or less ventral, the greater part of the lamellae or "claspers" being tucked away under the last abdominal sternite. In these figures the bristles on the basal part are omitted.

Figs. 1*b*–11*b* are profile views with all bristles except those on the lamellae and aedeagus omitted. In the case of 1*b*, 2*b*, and 7*b* the parts are in their natural positions, in the other figures the sternite bearing the aedeagus is shown separated from the corresponding tergite in order to give a better view of the appendages, while in 8*b* no profile of the tergal parts is given, it being practically identical with that shown in figure 9*b*.

Figs. 1*a*–11*a* represent the sternite and aedeagus viewed

from beneath, *i. e.* as from the right of figs. 1*b*–11*b* respectively.

Figs. 12 and 13 are profile and front views of the head of *H. personata* ♂ (magnified 10 diameters), in fig. 13 the antennae and all bristles being omitted.

Explanation of Plates VII—X.

Pl. VII. Fig. 1. *Hammomyia grisea.*
Fig. 2. ,, *sociata.*
Fig. 3. ,, *albescens.*
Pl. VIII. Fig. 4. *Hylephila dorsalis.*
Fig. 5. ,, *obtusa.*
Fig. 6. ,, *dissimilis.*
Pl. IX. Fig. 7. ,, *sponsa.*
Fig. 8. ,, *brevifrons.*
Fig. 9. ,, *buccata.*
Pl. X. Fig. 10. ,, *personata.*
Fig. 11. ,, *unistriata.*
Figs. 12, 13. ,, *personata*, ♂.

XIII. *The full grown larva of* Lycaena euphemus *Hb.* By T. A. Chapman, M.D., F.R.S.

[Read October 6th, 1920.]

Plate XI.

An unfortunate illness prevented my giving any proper attention to my ants' nests containing the larvae of *L. euphemus* during last winter. I fully expected that the result would be complete failure with them.

The failure proved to be very serious, but as a modified success, one larva actually reached the pupal stage, and as I got drawings of the larva made by Mr. E. C. Knight, it seems desirable to report the results, meagre as they are, in continuation of the record in last year's Transactions (p. 450).

The first note I made at the end of January reported one larva of *L. euphemus* dead, and that the disappearance of ant brood suggested that the larvae fed during the winter. Later, in February, this was confirmed by the ant brood being nearly exhausted.

On February 14th it is noted that the larvae are usually nearer the ant brood than previously, and are occasionally seen to be moving. There are also notes this month of advancing disease in the larvae of *L. euphemus*, small black patches appearing on them. In one nest the larvae are reported as looking well. They did not, however, receive adequate attention, and ant brood was scarce, though I have to thank Mr. Donisthorpe and Captain Purefoy for assistance on this point.

In the autumn I had found nests of *Myrmica scabrinodis* practically without brood, and up till June none of my correspondents met with any. The following are my notes from this time.

June 6th.—Since last note the history has been one of continuous disaster, the larvae having died off at intervals from black spot disease, whatever that may be, the result, I think, of their having at times been too damp—at any rate, broadly to want of proper attention during my illness. There is to-day one larva left in the *M. laevinodis* nest that had originally four larvae. This larva has some black marks in the honey-gland region and in the

prothorax. It has, however, distinctly grown in the last few days; a week ago, it seemed still of hibernating size. It is now 10 mm. in length and very distinctly thicker.

June 8th.—*L. euphemus* looks larger and has got rid of the black mark on prothorax. Its colour is decidedly paler; the tint is flesh-colour, but is perhaps rather darker than is usually called flesh-colour, a pale faintly brownish pink.

June 10th.—Larva growing; it is 11 mm. long, 4 wide and 3·5 high, rather hexagonal on cross-section, the two subdorsal elevations, the lateral flanges, and presumably the prolegs, being about equidistant elevations; only a very casual glance would regard the larva as cylindrical; the colour is hardly paler than on 8th. It has none of the original longer hairs of full length, only, indeed, a few stumps, of which two or three are nearly half length of original hairs; the finer hairs show under lens as a minute dark dusting. The disturbance of examining the larva, led to its showing some activity in moving about.

June 12th.—The *L. euphemus* larva is growing and looks well, although the black mark persists near the honey-gland and is accompanied by slight distortion of the segment. The attitude or, rather, position of the larva since it really began to feed is quite characteristic and identical with that of the young larva in the autumn, viz. just outside the heap of ant grubs. Just now, for instance, it is on the side of the nest head downwards, with the head touching or almost touching the upper examples of the ant grubs piled up in a corner of the nest. It has always been very rare and apparently accidental to see a larva of *L. euphemus* in any degree amongst the ant grubs.

June 14th.—13 mm. × 4 mm., larger, paler, less pink, has a dirty look, chiefly if not entirely due to the minute dark skin points; the black on 7th and after segments still looks very threatening. The larva moves about with some activity (for a *Lycaena*) always outside brood nest.

June 17th.—Larva figured by Mr. E. C. Knight. The larva, the only one surviving, has a good deal of black marking and deposit on 7th abdominal segments and on those behind, 8th, 9th, and 10th, with apparently a little deformity. Referring to the analogy of *L. alcon* and to the structure of this same larva, when entering hibernation in this same instar, I persuaded Mr. Knight to omit the

black mark and figure the larva as without it, though this was contrary, apparently, if not really, to his principle of never drawing anything that he did not actually see.

The larva is given to "hunching," *i. e.* contracting and thickening, so that being about 15 mm. when extended, at rest it is often only 12 mm. and nearly 5 mm. in diameter especially in the abdominal segments, which are thickest at all times, but especially when "hunched."

The colour is now very pale, so that it is difficult to say that it is really pink, such colour as there is being really due to the now well-separated, stellate points or bases of abortive hairs (many being probably lenticles) well seen in photograph of skins of larvae in Trans. Ent. Soc., 1919. These prevent the larva having the appearance of a very delicate skin, showing fat bodies, etc., as in *L. alcon*; but the conspicuousness of the dorsal vessels and its pulsations suggest that the delicacy and transparency of the skin is essentially as in *L. alcon*. The subdorsal eminences on 2nd, 3rd, 4th, 5th, and 6th abdominal segments are less marked than in the hibernating stage, owing to the general enlargement and stretching of the skin, the transverse section being now nearly circular instead of (seen dorsally) with a dorsal flatness apart from the eminences. The most notable change in the proportions of the larva is, that the first abdominal segment, instead of being small and weak, is much like the others, though with a little imagination it may be held to look just appreciably narrower. Here and there are stumps of the long hairs that the ants bit off in the early autumn days.

June 19th.—The larva has stationed itself at the top of the side of the nest. It was supposed to be not quite full grown, but it may be so and resting for pupation. The black mark on abl. 7 makes one not too hopeful of this being successfully accomplished.

June 20th.—In same position; no enlargement of thoracic segments.

June 21st.—Thoracic segments distinctly swollen. The larva was resting horizontally on the side of the nest near the top, and the ants have been more about it than normally; since yesterday they have put black material about the spiracular regions of the upperside. This would not wash off with water—another handicap to its due pupation.

June 22nd.—*L. euphemus* is found this morning to have

pupated satisfactorily, the cast skin is attached to the last segment, but not more than often occurs in Lycaenids. It will probably be removable, but the pupa is too immature to meddle with.

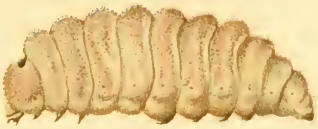
June 24th.—The pupa at first pale (very pale chitinous) has got very dark, and the wing-cases are becoming depressed. It is, therefore, obviously dead, due no doubt to injury in trying to throw off the black material of 7th segment. This unfortunately makes a figure of it unattainable.

My materials for describing the pupa of *L. euphemus* consist of the collapsed and discoloured pupa obtained from my larva, and a nearly or quite complete, but somewhat disintegrated, empty case obtained by Mr. Powell. Of *L. alcon*, with which to compare them, I have an empty case, a dead pupa with butterfly fully developed, and a collapsed case. I should have liked to have mounted portions of these and presented photographs of them, but the deficiency of specimens and other difficulties prevent this. So far as I have been able to examine them, I have not detected any differences between the two species that could be so demonstrated, though there are most probably some small differences in hairs and lenticles. The figures of *L. alcon* (Trans. Ent. Soc. 1919, Pl. XXIII) might fairly be taken to represent *L. euphemus* also, so far as such magnification enables them to be represented. The only difference discoverable with a hand lens, and this might possibly not hold in a longer series, is as regards the spiracles, which in *L. alcon* are low dark chitinous cones, and in *L. euphemus* are higher cones, only darkly chitinous at top, and with a margin of delicate-looking white tissue.

The pupae are about 11 to 12 mm. long, of the same form and colour as in the above-mentioned plate, and are unfortified by any definite forked or spiculate hairs. There is no scar of honey-gland.

Explanation of Plate XI.

Three aspects of full-grown larva of *Lycaena euphemus* Hb. × 4. It may be compared with that of *L. alcon* (Trans. 1919, Plate XXIII). For details of skin structure see Trans. 1919, Plates XXXIV *et seq.* It will be noted that the long hairs shown on Plate XXX (Trans. 1919) are represented by only a few stumps. (See Trans. 1919, p. 464.)



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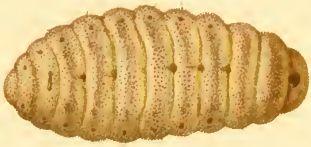


3.

FULL GROWN LARVA OF *LYCAENA EUPHEMUS*. × 4.

XIV. *Butterfly Migrations in British Guiana.** By L. D. Cleare, Jnr., F.E.S., Biological Division, Dept. Science & Agric., British Guiana.

[Read November 3rd, 1920.]

Migrations of butterflies occur from time to time in British Guiana, and many of the inhabitants can recollect having seen such phenomena, yet in most cases neither year, month, nor any other useful data can be supplied. Occasionally naturalists have recorded migrations when observed by themselves, but of records of this kind there are but few. In the Transactions of the Entomological Society for 1917 Mr. C. B. Williams, in a paper entitled "Some Notes on Butterfly Migrations in British Guiana," describes two such migrations observed by himself whilst on a visit to the colony in 1916; besides these Mr. Williams gives a number of observations supplied by inhabitants on other migrations, as well as some previously published accounts—in all sixteen migrations are recorded.

"It is difficult," says Mr. Williams, "even from the above records to get any indication of what is happening. On the real problem, why the migration takes place, there is still no light, and many more correlated observations must be made before there can be any hope of solving it." Mr. Williams adds, "British Guiana would seem to be a promising field for such investigations, but they must be extended over a series of years, with a number of competent observers stationed over the country."

As so little is known about these migrations, it seems advisable to record all observations until we can at least form some theory about them. It is with this object in view, as well as to form a continuation to Mr. Williams' paper, that the following observations are offered.

It has recently been my good fortune to witness one of these migrations at Georgetown, and it is here proposed to give the details connected with it, together with a number of other observations, collected from reliable sources, on

* Published by permission of the Director of Science and Agriculture, British Guiana.

other migrations, none of which have been recorded by Mr. Williams in his paper, or elsewhere, as far as I am aware. The majority of the records would, I presume, refer to *Callidryas eubule* L., the common sulphur-yellow butterfly of the colony, but there is also a record of a migration of *Pieris phileta* F., as well as one of *Catopsilia statira* Cram.

The localities and direction of these migrations are in every case indicated on the accompanying map. The signs used by Williams in recording a migration of *Catopsilia statira* in a recent number of the Trans. Ent. Soc. (1919, p. 76) have, for the sake of uniformity, been used in the map illustrating this paper.

Callidryas eubule L.

1. About 1.45 p.m. on March 18, 1919, Mr. A. Seton Milne, Government Veterinary Surgeon, on his arrival at the office drew my attention to the number of yellow butterflies about. On looking out it was obvious that a migration was taking place. No such migration was going on at 11.30 that morning. Mr. Milne informed me that he first observed these insects about 1 p.m. in Croal Street. He said that they were then more numerous than at the time when I saw them. I immediately left for Croal Street to make observations. The butterflies could be seen everywhere between this laboratory and Croal Street, a distance of half-a-mile north, and as the insects were travelling in an easterly direction the width of the swarm was at least that.

At 1.55 p.m. I noted that the butterflies were not passing in a continuous stream, but in twos and threes, and sometimes larger numbers. The direction of the flight was due east, and they were usually between six and twenty feet off the ground.

From my point of observation I could look over a width of about 120 yards, and the butterflies crossing this area were counted. During the first minute of observation thirty-three insects crossed. After that the count was made every five minutes. The results were as follows :—

1st 5 minutes	100 butterflies passed	=	20·0	per minute.
2nd ,,	95 ,, ,,	=	19·0	,,
3rd ,,	40 ,, ,,	=	8·0	,,
4th ,,	63 ,, ,,	=	12·6	,,

This works out at an average of 14·9 butterflies passing every minute.

It will be noticed that the number of these insects passing gradually decreased except in the last five minutes, but even then it was considerably less than at the beginning of the observation.

At 2.20 p.m. observations were started at another point about 650 yards east of the first position and about 80 yards further south. The distance over which the insects were counted was about the same as in the previous instance. Here 143 butterflies crossed the area in five minutes, making an average of 28·6 per minute, a number which was only exceeded during the first minute of observation.

To get some idea of the speed at which the butterflies were travelling, a distance of about 22 yards was paced off between two fences, and the insects crossing this space were timed from the moment they mounted one fence till they arrived at the next. Eight insects, taken at random, were thus timed; they all crossed the distance in about five seconds. This gives a speed of about 9·0 m.p.h.

By 2.30 p.m. the decrease in the number of butterflies was very noticeable, and I returned to the laboratory. By 2.45 p.m. the migration had ceased.

The next day I wrote a letter to both local newspapers asking any one who observed this migration to communicate with me. Concerning this particular migration I got but one observation, though there were a few relating to other migrations.

The late Mr. John Cunningham, Editor of the "Daily Argosy," informed me that while motoring along the East Coast, Demerara, on that day he observed large numbers of yellow butterflies in the vicinity of Paradise, which is about 16 miles from Georgetown, going in an easterly direction. On his arrival in Georgetown about 1.30 p.m. he noticed them too. From this we may conclude that the swarm was at least 16 miles in length.

The facts concerning this migration may be summarised as follows :—

Duration of migration . .	about $2\frac{3}{4}$ hours.
Direction of migration . .	East.
Prevailing wind . . .	N.E.
Speed of wind . . .	12·50 m.p.h.
Speed of migration . .	9·0 m.p.h.
Average number of insects crossing an area of about 120 yards wide	14·9 to 28·6 per min.

An idea of the number of butterflies, even in a small migration like this, may be gained by making a rough estimate. Taking twenty butterflies per minute, crossing a width of 120 yards, and taking the width of the swarm to be about half-a-mile, this would give 8,760 butterflies crossing per hour. This migration lasted for two and three-quarter hours, which would give about 24,090 butterflies in the swarm, and this would be a conservative estimate.

Unfortunately none of the insects were captured, so I can give no information as to the percentage of the sexes. The species concerned, however, may, I think, be safely put down as *Callidryas eubule* L.

2. Mr. B. H. Gainfort, of Sprostons, Ltd., describes having seen a very extensive flight of yellow butterflies, which, as far as I know, is the broadest swarm on record. He writes : " It was on the 6th July, 1912, going up the Demerara River that we passed through a swarm of orange-coloured moths (*sic*) so thick that we caught several hundred of them from the deck of the steamer ' Essequibo.' We entered the swarm somewhere between Diamond and No. 1 Island and got out of it somewhere about Dalgin. I estimated at the time that it was about 30 miles wide—flying from west to east. These moths (!) were in evidence a day or two afterwards on the Essequibo and Potaro Rivers." Obviously these " moths " were *Callidryas*.

Mr. E. E. Winter, B.Sc., Geological Surveyor of this Department, has given me several observations. They are particularly interesting on account of their being made in the interior of the colony, and on account of Mr. Winter's observation of their association with dry weather.

Mr. Winter tells me that such migrations can invariably be seen on the rivers during the dry season. Practically on every trip he makes some such swarm is observed, but the ones mentioned here stand out distinctly in his memory above all others. They may be taken as typical examples.

3. Mazaruni River, Makari Falls, October 1911. Dry season. Mr. Winter was camped on one of the islands in this fall. He observed " yellow and washed-out green " (? males or *Pieris*) butterflies crossing the river for about eight hours, say between 7.30 a.m. and 4 p.m. The insects were flying in twos and threes with varying distances between them; they could never be described as a thick cloud. Owing to the position of his camp, in one

of the side channels of the fall, Mr. Winter is unable to give the direction of the flight. This was the first such migration Mr. Winter witnessed.

4. Essequibo River, Mocco-mocco Point, February 1914, Mr. Winter says: "I was camped there for two or three days and on one day there was a stream of these yellows coming across the river from east to west in twos and threes with gaps between. The flight lasted all day—say between 7.30 a.m. and 4 p.m." From the position of his camp Mr. Winter is unable to give an idea of the width of the swarm.

5. Mr. G. F. Messervy, of the Department of Lands and Mines, who has been stationed at Christianburg on the Demerara River for the past three years, gives me the following observation.

He observed a migration of yellow butterflies in May or June 1916, on the Demerara River about 140 miles from its mouth. The insects were flying from west to east in batches of about twenty or so. They were yellow mixed with some paler-coloured ones. This was about the beginning of the wet season. Mr. Messervy cannot say definitely whether it was in May or June that he observed these insects.

Resting in Patches.

The four following observations by Mr. Winter on the resting of these insects in patches are interesting. As to whether they were obtaining some nourishment from the sand in the form of salts is problematical, but the suggestion made by Williams with regard to the urine from animals would certainly not hold good in at least the last three instances, whilst even in the first it is hardly likely, for not more than a couple of animals—mules—pass along this road each day.

6. Potaro Road, 7½ miles from Potaro Landing. September 1915. Dry season. A number of yellow and greenish-white butterflies, some with a distinct orange tinge, were resting in the middle of the road in bright sunlight on a sandy patch over an area of about ¾ to 1 square yard. The butterflies seemed to be collecting at this spot from both sides of the valley out of the forest. (The Potaro Road is in the Mahdia Valley between Eagle Mt. and the Kaiteur Mountains.) The insects were packed close together,

and as the buggy drove through the swarm they were disturbed, and striking against the spokes made a decided tapping sound. The insects alighted on the same spot after the buggy had passed a few hundred yards.

7. Mazaruni River, Sansankopai. Yellow butterflies were clustered together on a sandbank on an island in the middle of the river. The patch was not as large as the Potaro patch mentioned above. Mr. Winter cannot give the date of this observation.

8. Yawakuri River, June 1919. A small boat that had sunk in the river was partially exposed and on one of the exposed parts was a small patch of sand, deposited while the river was much higher. The sand was then quite dry, and in strong sunlight. On this small patch of sand about a dozen yellow butterflies had collected.

9. Pomeroon River, Issururu Creek, March 1920. A large tree had fallen and was stretched across the creek, supported on one side by its roots and on the other by the thick mass of branches, it was in this way not submerged. Some of the branches, however, were in the water, and around these a small sandbank had gradually formed. A part of the bank was well above water, and quite dry, so dry that the sand was beginning to blow; it was also in the full heat of the sun. On this patch of sand about twenty yellow butterflies had collected. Mr. Winter first observed them about 9 a.m., and on his return to camp about 5 p.m. they were still there. Occasionally one of the butterflies would leave the swarm and fly off to one of the nearby trees, but in a few minutes it would return again.

Catopsilia statira Cram.

10. Mr. A. A. Abraham, Horticultural Superintendent of this Department, while engaged on an agricultural survey of the Rupununi Cattle Trail, collected five butterflies from a migration which took place on the Yawakuri Savannahs on June 16, 1919, and forwarded them to the Biological Division. These insects proved to be *Catopsilia statira* Cram., and were all males.

In a letter to me he says: "The specimens I collected were taken on the wing and the flight was then directly across the Yawakuri Savannahs; the migration was also across the Berbice River. . . . The insects were travelling in very large numbers and with a steady flight, but I do not

think they were so thick as to constitute a cloud." He adds, "The insects were flying in a south-easterly direction; the direction of the wind being north-east."

He further states: "As far as my observations extend I have noticed that the butterflies always appear during the months of June, July, and August, and sometimes their migration continues in the early part of September if the weather remains dry. The flight ceases if it should rain during the migration. The insects always travel at right angles to the wind." These observations were made in the North-West District at Issororo, and may be taken to apply to *Callidryas*.

Pieris phileta F.

11. My father supplies the following observations on a large migration of *Pieris phileta* F., which he witnessed on the Courantyne Coast, Berbice, in September 1919.

About the middle of September he saw a migration of butterflies taking place at Albion Magistrate Court, which is about 12 miles from New Amsterdam. The insects were present in very large numbers, and in giving an idea of the density he estimated that there were about 10 insects to the square yard, and added that to say they were like falling snow would certainly describe the appearance. The insects were present as far down the coast as Bramfield, which is 4 miles from New Amsterdam, so that the swarm was about 8 miles wide. The insects were flying towards the foreshore —that is, in a northerly direction. This would be across the prevailing wind, which is usually north-easterly, but on this point he can give no definite information.

On the following day he again observed them at Whim, about 6 miles further up the coast, and about 18 miles from New Amsterdam. The insects were just as numerous as on the previous day, and on this day several were collected against the glass windows in the rest house. They all proved to be *Pieris phileta* F. Of eighteen insects collected in this way ten were males, while eight were females. This migration took place between 8 and 11 a.m.

On making inquiries from the Police in the district he was informed that such migration had been going on for the past week or ten days, and that they often occurred in that district.

During this year I have bred the insect in Georgetown

on the food-plant *Cleome polygama* L., while Mr. H. W. B. Moore has bred it on *Cleome speciosa* Kth., cabbage, mustard, and horse-radish; all closely related plants.

While this insect occurs in the county of Demerara it is far more common in Berbice, where it can usually be seen, and where its migrations only appear to take place; in the same way the *Callidryas* are more or less confined to the Demerara and Essequibo districts.

Summary.

It will be observed that three of the migrations of *Callidryas* were from west to east. First the one observed by Mr. Gainfort in 1912, then the one seen by Mr. Messervy in 1916, and lastly, the one which I witnessed in March 1919. Mr. Williams points out in his paper that the general direction of such migrations was from north-west to south-east and *vice versa*, and the three migrations mentioned above may be taken as agreeing with this in a general way. He adds, however: "There is yet no record of a migration in a north-east or south-westerly direction." The migration observed by Mr. Winter at Mocco-mocco Point, Essequibo River, in February 1914 was from east to west, practically just the opposite direction to all previous records, and to Mr. Williams' remark quoted above.

Mr. Williams also says: "Secondly, all migrations of *Callidryas* in which date is recorded took place between May and October." The migration which I observed took place on March 18th, while Mr. Winter observed one in February 1914.

A very interesting point which was brought out by Mr. Winter's observations is that such migrations are of frequent occurrence in the dry season. He says that the generally accepted opinion is that such migrations *precede* dry weather. Again, the recent migration proved to be an exception, for it occurred when the rainfall was above the normal for the year, and this condition continued for some weeks after.

Mr. Williams in his paper on the migration of *Catopsilia statira* suggests that the reason for these insects settling in patches on the ground is for the purpose of obtaining nourishment in the form of salts from areas "where the urine from animals passing along the road had recently dried up." This theory would certainly not hold good in at least three of the instances given here—Nos. 7, 8, and 9—as in these places there are no such animals, while in the

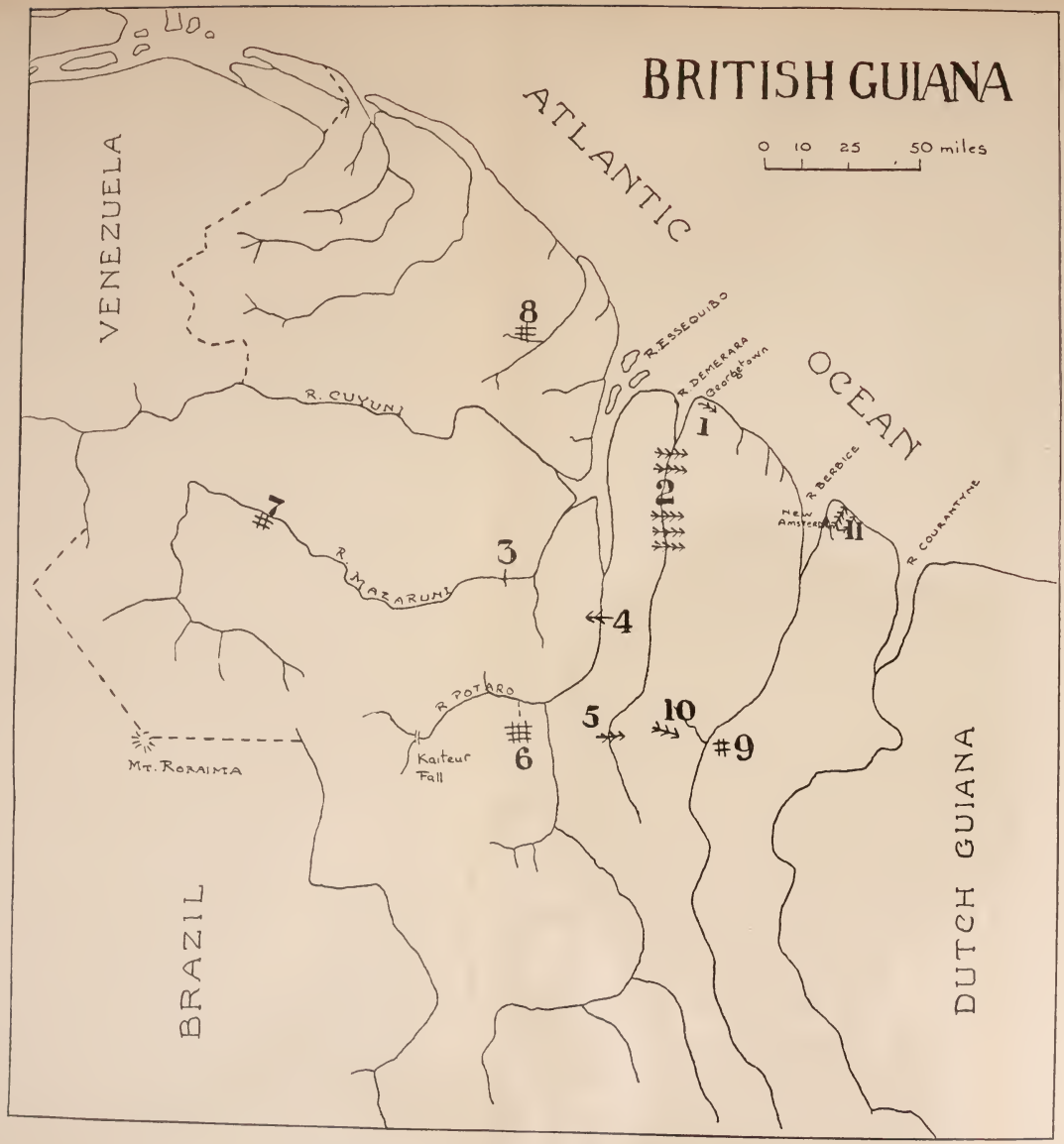
case of observation No. 6 it seems very unlikely, for not more than a couple of animals pass along this road each day. It would seem more likely that, apart from the natural gregarious habits of these insects, the object of such swarming would be to obtain a certain amount of heat and dryness, conditions that are almost impossible to obtain in the forest except in such places where the swarms were observed.

The observation on *Catopsilia statira* is interesting on account of its locality, while that of *Pieris phileta* is notable for its density.

In conclusion I wish to express my thanks to those gentlemen, and especially to Mr. Winter, who have so kindly allowed me to make use of their observations.

Explanation of Map.

Sketch map of British Guiana showing localities where migrations or unusual numbers of butterflies were seen. For detailed explanation of signs used see Trans. Ent. Soc. Lond., 1919, p. 77 and Pl. VI, the arrowheads indicating direction and extent of migrations, and the crosses the scale of abundance of the insects at rest.



BUTTERFLY MIGRATIONS IN BRITISH GUIANA.

XV. *Preliminary Note on the interpretation of Insectan and Myriopodan structures through a comparison with the structures of* Crustacea. By G. C. Crampton, Ph.D.

(Massachusetts Agricultural College, Amherst, Mass.)

[Read November 3rd, 1920.]

In making a series of studies of the head and terminal structures of the Arthropods related to insects, with a view to determining the lines of development followed in the evolution of the insectan types of Arthropods, I have been struck with the fact that many of the currently accepted interpretations of the structures in insects are surprisingly incorrect. In the following brief note, I would call attention to the more glaring inaccuracies, leaving the more detailed discussion of the various phases of the subject to be dealt with in a series of papers in which each of the features can be taken up separately and illustrated by the necessary drawings to prove the points under discussion.

One of the most glaring of the inaccuracies current concerning the interpretation of the structures of insects is the universally accepted view that the lobe-like structures on either side of the hypopharynx of insects (called superlinguae or "paraglossae") represent the first maxillae (maxillulae) of Crustacea. These structures on either side of the hypopharynx are *not* the homologues of the first maxillae of Crustacea at all, but represent the *paragnaths* of Crustacea, as any one who will take the trouble to compare a mayfly naiad (nymph) with one of our common Isopods, such as *Asellus*, can readily see for himself. A comparison of the paragnaths of higher Crustacea with similar structures in the lower forms, such as *Apus*, would indicate that the paragnaths are merely detached lobes of the first maxillae, which have taken up a position behind (and slightly between) the mandibles.

Folsom is apparently responsible for the mistaken view that the paragnaths of insects (*i. e.* the superlinguae or "paraglossae") represent the maxillulae (first maxillae) of Crustacea, for his drawing of the embryo of *Anurida*

showing what purports to be the "superlingual neuromere" of a distinct segment, whose appendages are supposed to be the superlinguae, has been widely copied and referred to in recent entomological literature. Folsom's observations in this matter, however, have been shown to be utterly unfounded by such investigators as Philiptschenko, who has made a careful study of the embryological development of the same group of insects studied by Folsom, and it is indeed surprising that Folsom's conclusions have been practically universally accepted among zoologists despite this fact, and in the face of all other embryological evidence brought forward in scores of papers on the subject, in which it has been clearly shown that the maxillae of insects are homologous with the maxillulae (first maxillae) of Crustacea, and the superlinguae cannot therefore be homologous with the maxillulae (first maxillae), as the easily-persuaded entomologists would have us believe!

The following table (in which I have employed, in a modified form, the terminology used by Heymons, 1901, in his excellent monograph of the development of *Scolo-*

Insects.	Chilopods.	Higher Crustacea.
Protocephalon.	{ Acron / Preantennal segment. }	Protocephalon.
Antennal segment.	Antennal segment.	Antennular segment.
Intercalary segment.	Intercalary segment.	Antennal segment.
Mandibular segment.	Mandibular segment.	Mandibular segment.
Paragnaths. / First maxillary segment.	(Paragnaths.) / First maxillary segment.	Paragnaths. / First maxillary segment.
Labial, or second maxillary segment. (Last segment of head.)	Second maxillary segment. (Last segment of head.)	Second maxillary segment.
First thoracic segment.	"Poison claw segment."	First maxilliped segment. (Last segment of head.)

pendra) will serve to indicate the true relationship of the parts of an insect's head to those of Chilopods and higher Crustacea from the standpoint of embryology—which after all furnishes us with the only safe guide in such matters. Following Buxton and other recent students of the brain-structures in Arthropods, I have provisionally accepted the view that the preantennal ganglion of *Scolopendra* is not represented in an insect's head, and that the syncerebrum of *Scolopendra* corresponds to the protocerebrum of insects.

In the foregoing table, I have placed the "paragnaths" of Chilopods in parentheses, since no instance of their occurrence in any true Chilopod has been recorded, so far as I am aware. Paragnaths do occur, however, in such forms as *Scolopendrella* (and are possibly also represented in the house centipede, *Scutigera forceps*), which are closely related to the Chilopods, and for the sake of completeness, they have been included in the list of Chilopodan structures in order to compare all of the parts of Chilopods with those of insects and Crustacea. I would also call attention to the fact brought out in the table, that the head of a higher Crustacean is made up of one more segment than the head of an insect, since the first maxilliped segment of these Crustacea usually becomes more closely associated with the head than with the "thoracic" region. The head of these higher Crustacea is thus composed of *seven* segments, while the head of an insect is composed of but *six* (so far as the embryological evidence would indicate), and it is folly to state that an insect's head is also composed of seven segments, when there is absolutely no proof for such a claim; for the first maxillipeds, which are so closely associated with the head region in the higher Crustacea, are homologous with the first thoracic legs of insects, and these appendages do not enter into the composition of an insect's head to form a seventh segment!

If the superlinguae or "paraglossae" (*i. e.* the paragnaths) of insects are homologous with the paragnaths of Crustacea, and if the maxillulae or first maxillae of Crustacea are homologous with the maxillae of insects, it is self-evident that the superlinguae (paragnaths) cannot represent the maxillulae or first maxillae of Crustacea, and those who claim that this is so, must produce some real evidence in support of their claim that the superlinguae are the representatives of the maxillulae, or else

admit that this view has no foundation in fact. In proof of my contention that the superlinguae (" paraglossae ") of insects are homologous with the paragnaths of Crustacea, I would cite the following facts.

1. The superlinguae (*e. g.* of immature Ephemerids) are situated between the mandibles. The paragnaths of many Crustacea occupy exactly the same position.

2. The superlinguae show no trace of limb structure. The paragnaths also show no trace of limb structure.

3. The superlinguae function as a secondary underlip (also provided with organs of taste). The paragnaths likewise function as a secondary underlip.

4. The superlinguae develop as simple protuberances not located in the position typical of the forming mouth-part-limbs. The paragnaths develop as similar simple protuberances not located in the position typical of the forming mouthpart-limbs.

5. The superlinguae are not distinct appendages of a distinct segment. The paragnaths are not distinct appendages of a distinct segment.

6. The superlinguae have no distinct neuromere, or embryonic ganglion. The paragnaths also have no distinct neuromere, or embryonic ganglion.

From the foregoing, it should be evident that since the superlinguae and paraglossae occupy the same positions, have a similar development, structure and function, etc., the inevitable conclusion is that the two structures are in every way homologous. Furthermore, the superlinguae cannot be homologised with the first maxillae (maxillulae) because there are already other structures present in the insect's head region, namely the maxillae, which are in every way homologous with the maxillulae, or first maxillae of Crustacea, as is indicated by the following facts.

1. The maxillulae are situated between the mandibles and second maxillae in Crustacea. The (first) maxillae of insects are situated between the mandibles and the second maxillae forming the labium.

2. The maxillulae of Crustacea are evidently modified legs. The maxillae of insects are also evidently modified legs.

3. The maxillulae of Crustacea do not function as a secondary underlip. The maxillae of insects do not function as a secondary underlip.

4. The maxillulae of Crustacea develop in the location typical of the other limbs. The maxillae of insects also develop in the location typical of the other limbs.

5. The maxillulae of Crustacea are distinct appendages of a distinct segment. The maxillae of insects are distinct appendages of a distinct segment.

6. The maxillulae of Crustacea have a distinct neuromere in the embryonic stages. The maxillae of insects have a distinct neuromere in the embryonic stages.

By comparing these two lists of points together, it will be seen that the maxillulae (first maxillae) of Crustacea correspond in situation, form, function, structure and development, with the maxillae of insects, and the superlinguae correspond in all of these points with the paragnaths, while there is no such correspondence between the maxillulae and the superlinguae. I would therefore maintain that the superlinguae of insects are in every way homologous with the paragnaths of Crustacea, and these structures should therefore be called paragnaths in insects.

Another absolutely unfounded and incorrect statement which one encounters with disheartening regularity in the zoological and entomological textbooks, is the absurd statement that the primitively biramous condition of the limb of lower Crustacea is preserved in the highly modified maxillae of insects. Thus the galea, etc., of the insect's maxilla is supposed to represent the endopodite of such a biramous limb, while the maxillary palpus is supposed to represent the exopodite. A comparison of the parts of the maxilla of one of the primitive insects such as *Machilis* with a series of Crustacean appendages, however, very clearly indicates that the galea and lacinia correspond to lobe-like processes (sometimes spoken of as "gnathobases") of the basal segments of a limb whose terminal segments form the maxillary palpus, as embryology has long shown is the case, and it is most astonishing that such unfounded views could gain the widespread acceptance which has been accorded them.

If one will take the trouble to compare a series of limbs homologous with the mandibular appendages of insects, using the following sequence, (1) the trilobite *Triarthrus*, (2) the Crustacean *Nebalia*, (3) the Crustacean *Mysis*, (4) the Crustaceans *Asellus*, *Apseudes* and *Diastylis*, and (5) the insect *Machilis*, he can readily trace the development of the basal segment of the limb which grows at the

expense of the endopodite (the exopodite is completely lost), the endopodite becoming reduced to a three-segmented mandibular palpus which is lost in many of the Crustacea and in insects, while the spine-like and tooth-like processes of the gnathobase region of the basal segment of the limb become modified to form the incisors of the mandible, or unite to form the molar surface of the mandible. The so-called lacinia mobilis of such a mandible is apparently nothing more than certain broadened or fused hair-like appendages forming the gnathofimbrium, or mandibular fringe. I have taken up this feature in an article which will shortly be published, and have referred to it here merely to point out the fact that the mandible of an insect such as *Machilis*, for example, represents only one single segment of a limb, while the parts of the maxilla which form the cardo, stipes, galea, lacinia, etc., represent more than a single segment of a limb (as I have pointed out in another paper), and it is quite incorrect to state, as so frequently is done, that the parts of the maxillae are repeated in the mandible of an insect. I have not been able to find any indications of the cardo, stipes, galea or lacinia in the mandible of any insect whatsoever, and the statement that the parts of the maxillae are repeated in the mandibles was apparently made without studying the evolution of the structures in question from the trilobites through a series of Crustacea such as that mentioned above, to the lower insects such as *Machilis*.

There are many other features of insectan anatomy upon which a comparison with the structures of Crustacea has thrown a flood of light, such, for example, as the fact that the cerci of insects (*e. g. Machilis*) represent the endopodites of the flagelliform uropods of such Crustacea as *Apseudes*, or the fact that the styli of insects (and also such modifications of the styli as the gonopods of male insects, or the dorsal valvulae, etc., of the ovipositor of the female insect) represent the exopodites of the "swimmerets" or their homologues in Crustacea; but these and similar points can be brought out more advantageously in a series of articles, accompanied by suitable illustrations, and taking up each phase of the subject in detail. The foregoing article is therefore merely offered as a preliminary note to point out the principal conclusions which have been gained from a more extended series of studies which will be published later.

As a final point in the discussion of the interpretation of insect morphology in the light of a comparison with Crustacean structures, I would emphasise the fact that in every instance the condition met with in the Crustacea, rather than that occurring in the Myriopoda, has offered the key to the solution of the meaning of the parts in insects; and the series of studies have convinced me that insects are anatomically intermediate between the higher Crustacea on the one side, and the Myriopoda (such as *Scolopendrella*, *Pauropus*, etc.) on the other. The lines of development of the lower insects such as *Campodea*, etc., which resemble *Scolopendrella*, and other Myriopoda, however, appear to end in a "cul de sac" leading nowhere; while the lines of development of the apterygotan insects nearer the Crustacea (*e.g. Machilis*, *Lepisma*, *Nicoletia*, etc.) are those which lead to the development of the pterygotan type of insect, and the lowest winged insects such as the mayflies have carried over a surprisingly large number of "crustaceoid" characters, particularly in the immature stages. I would further point out that *Machilis* is anatomically a far more primitive insect than is usually supposed to be the case, and in many instances it has furnished the connecting links or intermediate stages enabling one to compare the structures of the Ephemerids and other lower winged insects with those of the Crustacea.

XVI. *New species of* Staphylinidae *from Singapore.* Part IV (Conclusion). By Malcolm Cameron, M.B., R.N., F.E.S.

[Continued from Trans. Ent. Soc. Lond. 1920, p. 212.]

[Read November 17th, 1919.]

TABLE OF THE SUB-FAMILIES.*

1.	Head in front of the eyes with a raised or thickened border, under which the antennae are inserted.	2.
—	Head in front of the eyes without a raised or thickened border, the antennae either freely inserted on the front, or on or beneath the simple side margin of the head in front of the eyes.	4.
2.	Posterior coxae transverse, not prominent.	3.
—	Posterior coxae conical, prominent .	Paederinae.
3.	Gular sutures usually fused together for the greater part, often indistinct, at least fused at one point . . .	Oxytelinae.
—	Gular sutures completely separated .	Megalopsinae.
4.	Antennae 12-jointed	Adinopsinae.
—	Antennae 10- or 11-jointed.	5.
5.	1st joint of maxillary palpi elongate.	6.
—	1st joint of maxillary palpi short.	7.
6.	Tarsal formula 5, 5, 5	Steninae.
—	Tarsal formula 4, 4, 4, or 5, 4, 4 . .	Evaesthetinae.
7.	Antennae inserted in a cup-shaped depression on the underside of the head .	Pygosteninae.
—	Antennae not so inserted.	8.
8.	Antennae inserted on the front margin of the head	Staphylininae.
—	Antennae otherwise inserted.	9.

* The characters given in the tables do not necessarily apply to species not found in Singapore.

9. Antennae inserted freely on the lateral borders of the front; the elytral epipleurae not separated from the rest of the surface by a raised line; the elytra not extending beyond the metathorax . . . . . **Aleocharinae.**

— Antennae inserted under the simple (not raised or thickened) lateral borders of the front; the elytral epipleurae usually separated by a raised line from the rest of the surface; the elytra extending beyond the metathorax . **Tachyporinae.**

TABLE OF THE TRIBES.

I. Sub-family **Oxytelinae.**

1. Anterior coxae globose, not prominent; the base of the abdomen keeled below Piestini.
— Anterior coxae conical, prominent; the base of the abdomen not keeled below. 2.
2. Head with two ocelli . . . . Omaliini.
— Head without ocelli. 3.
3. Abdomen margined . . . . Oxytelini.
— Abdomen not margined . . . Osoriini.

II. Sub-family **Megalopsinae.**

1. Eyes large and prominent; 1st joint of maxillary palpi short; thorax subcylindrical; scutellum distinct; abdomen bordered. Tarsal formula 5, 5, 5 Megalopsini.

III. Sub-family **Steninae.**

1. Eyes large and prominent; maxillary palpi with the 1st joint elongate. Tarsal formula 5, 5, 5 . . . Stenini.

IV. Sub-family **Evaesthetinae.**

1. Tarsal formula 4, 4, 5 . . . . Stenaesthetini.
— Tarsal formula 4, 4, 4 . . . . Evaesthetini.

V. Sub-family **Paederinae.**

1. 4th joint of maxillary palpi large . . Pinophilini.
— 4th joint of maxillary palpi small . . Paederini.

VI. Sub-family **Staphylininae.**

1. Anterior portion of the prosternum separated by a suture from the posterior portion. Antennae at the base usually nearer to each other than to the eyes, at least not farther apart. Xantholinini.
— Anterior portion of the prosternum not separated by a suture from the posterior portion. 2.
2. Anterior angles of the thorax extended considerably beyond the anterior angles of the prosternum. Under side of the head with a longitudinal raised line at least behind . . . Quediini.
— Anterior angles of the thorax not or scarcely extended beyond the anterior angles of the prosternum. Under side of the head without longitudinal raised line . . . . . Staphylinini.

VII. Sub-family **Pygosteninae.**

One genus: **Delibius** Fam. (*q. v.*).

VIII. Sub-family **Tachyporinae.**

1. Sides of the thorax explanate; sculpture of the head and thorax coarse and rugose . . . . . Megarthropsini.
— Sides of the thorax not explanate; sculpture of the head and thorax fine or very fine, not rugose . . . Tachyporini.

IX. Sub-family **Adinopsinae.**

One genus: **Adinopsis**, n. (*q. v.*).

X. Sub-family **Aleocharinae.**

1. Head more or less produced in front. 2.
— Head not produced in front. 4.
2. Tarsal formula 4, 4, 4 . . . . Diglottini.
— Tarsal formula 4, 5, 5, or 4, 4, 5. 3.
3. Tarsal formula 4, 5, 5 . . . . Pronomaeini.
— Tarsal formula 4, 4, 5 . . . . Myllaenini.
4. Antennae 10-jointed, tarsi 4-jointed . Oligotini.
— Antennae 11-jointed. 5.
5. Tarsal formula 5, 5, 5 . . . . Aleocharini.

—	Tarsal formula otherwise	5.
6.	Tarsal formula 4, 4, 5 . . .	Bolitocharini.
—	Tarsal formula, 4, 5, 5, 4, 4, 4, or 3, 4, 4.	Myrmedoniini.

TABLE OF THE GENERA.

Piestini.

1.	Abdomen bordered	**Eleusis** Cast.
—	Abdomen not bordered.	2.
2.	Anterior tibiae serrated externally .	3.
—	Anterior tibiae not serrated.	5.
3.	Anterior coxae separated . . .	**Leptochirus** Germ.
—	Anterior coxae contiguous .	4.
4.	Mandibles much produced, their length about twice that of the head; 3rd joint of the maxillary palpi elongate, as long, or nearly as long, as the last .	**Borolinus** Bernh.
—	Mandibles not much produced, their length at most a little longer than the head; 3rd joint of maxillary palpi broader than long, much shorter than the last	**Priochirus** Shp.
5.	Anterior tibiae with two small spines near the apex on the external border .	**Ancaeus** Fauv.
—	Anterior tibiae without spines on the external border.	6.
6.	Abdomen obliquely striolate; posterior angles of the thorax somewhat prominent	**Holosus** Motsch.
—	Abdomen not striolate, normally punctured; posterior angles of the thorax not prominent	**Lispinus** Er.

Omaliini.

1.	Labrum emarginate anteriorly; mesosternum not keeled; last joint of the maxillary palpi slender, distinctly smaller than the 3rd . . .	**Phloeonomus** Heer.

Oxytelini.

1.	Anterior and middle tibiae spinose externally.	2.
—	Anterior and middle tibiae not spinose externally.	3.

2. Anterior tibiae with a double row of spines; species cylindrical with strongly geniculate antennae . . **Bledius** Mannh.
— Anterior tibiae with a single row of spines; species rather depressed, antennae not or scarcely geniculate. Thorax more or less tri-sulcate (except in *thoracicus*); intermediate coxae approximate . . . . **Oxytelus** Er.
3. Scutellum visible. Elytra without epipleurae, the postero-internal angles separately rounded so that a small triangular space is apparent at the suture . . . . . **Thinobius** Kiesw.
— Scutellum concealed. Elytra with distinct epipleurae, the postero-internal angles not separately rounded . . **Trogophloeus** Mannh.

OSORIINI.

1. Tibiae spinose. 2.
— Tibiae not spinose. 3.
2. Antennae geniculate; anterior tibiae dentate-spinose; last joint of the tarsi slender, not tumid . . . . **Osorius** Latr.
— Antennae not geniculate; anterior tibiae simply spinose; last joint of the tarsi tumid . . . . . **Mimogonus** Fauv.
3. Thorax strongly contracted at the base; 4th joint of maxillary palpi subulate . **Paragonus** Fauv.
— Thorax not or scarcely contracted at the base; 4th joint of maxillary palpi not subulate . . . . . **Holotrochus** Er.

MEGALOPSINI.

1. Antennae 11-jointed; tarsal formula 5, 5, 5. Form oblong, stout. Tibiae simple . . . . . **Megalops** Er.

STENINI.

1. Eyes very large, occupying nearly the whole of the side of the head; 4th tarsal joint simple or bilobed; apex of abdomen without styles . . **Stenus** Latr.

Stenaesthetini.

1. Antennae very slender; abdomen except for the 1st (visible) and 5th segments immarginate. Tarsal formula 4, 4, 5. Antepenultimate joint simple; sculpture umbilicate on head and thorax . **Stenaesthetus** Shp.

Evaesthetini.

1. Tarsi 4-jointed; head deeply impressed on either side of the front; abdomen distinctly margined. Head and thorax very smooth and shining. . **Edaphus** J. Lec.

Pinophilini.

1. Abdomen bordered. 2.
— Abdomen not bordered. 3.
2. Labrum simple; last joint of the maxillary palpi narrow and elongate . . **Pinophilus** Gr.
— Labrum bilobed; last joint of the maxillary palpi securiform . . **Neopinophilus** Cam.
3. Sculpture of abdomen strongly imbricate; last joint of maxillary palpi securiform; terminal joint of antennae of normal length . . . . . **Palaminus** Er.
— Sculpture of abdomen not imbricate; last joint of maxillary palpi slender, fusiform; terminal joint of antennae very elongate, forming nearly half the length of the organ . . . . **Eucirrus** Fauv.

Paederini.

1. Antennae not geniculate. 2.
— Antennae strongly geniculate. 11.
2. 4th tarsal joint dilated, the distal margin more or less emarginate, the 5th joint articulating on its dorsal surface near the base, giving the appearance when viewed from above of the 4th joint being bilobed.* 3.

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* All authors speak of this joint being bilobed. This, however, is incorrect. When examined as a microscopical preparation the structure is found to be as above described.

— 4th tarsal joint simple, not presenting a bilobed appearance. 7.

3. 4th joint of maxillary palpi very short, broad and obtuse; anterior tarsi dilated **Paederus** F.

— 4th joint of maxillary palpi minute, subulate. 4.

4. Labrum bi-dentate or slightly emarginate in the middle of the anterior border. 5.

— Labrum with 5 or 6 distinct teeth; head with simple puncturation; elytra strongly punctured, more or less in rows . . . . . **Psilotrachelus** Kr.

5. Labrum bidentate. . . . . 6.

— Labrum emarginate . . . . . **Acanthoglossa** Kr.

6. Thorax elongate; abdomen parallel; anal styles distinct . . . . **Astenus** Steph.

— Thorax shorter and broader; abdomen somewhat contracted at the base; anal styles wanting. . . . . **Stilicopsis** Sachse.

7. Antennae with the first two joints stout, the following slender . . . **Thinocharis** Kr.

— Antennae of normal build. 8.

8. Neck slender or very slender. 9.

— Neck broad . . . . . **Medon,** Steph.

9. Labrum without teeth; 1st joint of the antennae sulcate from apex nearly to the base . . . . . **Parascopaeus** Cam.

— Labrum toothed; 1st joint of the antennae not sulcate. 10.

10. 1st joint of the posterior tarsi elongate, distinctly longer than the last; tongue bifid . . . . . **Stilicus** Latr.

— 1st joint of the posterior tarsi short, not longer than the last; tongue trifid . **Scopaeus** Er.

11. Tibiae spinose; 4th joint of the maxillary palpi distinct, conical; tongue bilobed . . . . . **Cryptobium** Mannh.

— Tibiae setose; 4th joint of the maxillary palpi very small, obtuse, scarcely visible; tongue simple . . . **Calliderma** Motsch.

XANTHOLININI.

1. Tibiae not spinose . . . . **Somoleptus** Shp.

— Tibiae spinose. 2.

2. Antennae geniculate. 3.
— Antennae not geniculate . . . **Diochus** Er.
3. 3rd joint of the maxillary palpi longer than the 2nd. 4.
— 3rd joint of the maxillary palpi not longer than the 2nd. 5.
4. Gular sutures obsolete; intermediate coxae narrowly separated . . . **Oligolinus** Cas.
— Gular sutures distinct; intermediate coxae widely separated . . . **Leptacinus** Er.
5. Labrum broadly emarginate . . . **Eulissus** Mannh.
— Labrum with several short blunt teeth . **Thyreocephalus** Guer.

STAPHYLININI.

1. Tarsal formula 4, 4, 5; small depressed species . . . . . **Holisomimus** Cam.
— Tarsal formula 5, 5, 5. 2.
2. Anterior and posterior femora furnished below with two rows of fine spines . **Belonuchus** Nordm.
— Anterior and posterior femora not furnished below with two rows of spines, at most (in some species of **Philonthus**) with a few spines towards the apex. 3.
3. 2nd joint of the antennae thickened, much thicker than the 3rd . . . **Actobius** Fauv.
— 2nd joint of the antennae not thickened, not or scarcely thicker than the 3rd. 4.
4. Lateral setae of the thorax placed on the side margin itself or very near thereto. 5.
— Lateral setae of the thorax distant from the side margin. 6.
5. Anterior tarsi dilated in both sexes; mesosternum without a transverse impressed line . . . . **Orthidus** Rey.
— Anterior tarsi at most dilated in the ♂; mesosternum with a transverse impressed line . . . . . **Philonthus** Curt.
6. Last joint of the maxillary palpi nearly twice as long as the preceding; mesosternum broadly rounded behind . **Hesperus** Fauv.
— Last joint of the maxillary palpi scarcely longer than the preceding; mesosternum pointed . . . . . **Cafius** Steph.

QUEDIINI.

1. Antennae strongly geniculate . **Acylophorus** Nordm.

PYGOSTENINI.

1. Form navicular. Tarsal formula 4, 4, 5 : legs long; intermediate coxae widely separated; antennae longer than the head and thorax; scutellum very large **Delibius** Fauv.

MEGARTHROPSINI.

1. Sides of the thorax explanate; sculpture of head and thorax coarse and rugose **Megarthropsis** Cam.

TACHYPORINI.

1. Tarsal formula 5, 4, 4 . . . **Atanygnathus** Jacobson.
— Tarsal formula 5, 5, 5. 2.
2. Last joint of the maxillary palpi small, subulate; abdomen not or scarcely margined . . . . . **Conosoma** Kr.
— Last joint of the maxillary palpi not subulate, often longer than the 3rd. 3.
3. Species very convex, strongly contractile and retractile; posterior angles of the thorax effaced; tibiae not spinose . **Mimocyptus** Cam.
— Species much less convex, not contractile; posterior angles of the thorax distinct; tibiae more or less spinose. 4.
4. 1st joint of the posterior tarsi as long as the three following together . . **Leucoparyphus** Kr.
— 1st joint of posterior tarsi shorter than the three following together. 5.
5. 1st visible dorsal segment at the base on either side of the middle line with a short transversely extended tomentose patch. Species larger . . . **Tachinomorphus** Kr.
— 1st visible dorsal segment without tomentose patches. Species small or very small . . . . . **Coproporus** Kr.

GYMNUSINI.

1. Head deflexed, concealed; the sides and anterior margin of the thorax forming a semi-circle, posterior angles prominent, pointed. Legs slender, all the

tarsi 5-jointed, the 1st joint of the posterior pair as long as the three following together . . . . **Leucocraspedum** Kr.

MYLLAENINI.

1. Tarsal formula 4, 4, 5. Labial palpi slender, styliform, obscurely 3-jointed; maxillary palpi very long and slender **Myllaena** Er.

PRONOMAEINI.

1. Tarsal formula 4, 5, 5. Labial palpi very long, styliform, not jointed. Maxillary palpi very long and slender, the 4th joint very short, subulate . . **Pronomaea** Er.

DIGLOTTINI.

1. Tarsal formula 4, 4, 4. Labial palpi very long and slender, obscurely 3-jointed. Maxillary palpi very long and slender, the last joint very small, subulate . **Diglotta** Champ.

OLIGOTINI.

1. Tarsal formula 4, 4, 4. Antennae 10-jointed. Labial palpi obscurely 3-jointed . . . . . **Oligota** Mannh.

BOLITOCHARINI

1. Mesosternal process narrow and pointed, the intermediate coxae contiguous or but little separated. 2.
— Mesosternal process broader, apex rounded, the intermediate coxae distant. 14.
2. Labial palpi 2-jointed. 3.
— Labial palpi 3-jointed, the 2nd joint much shorter than the 1st and 3rd. Right mandible with a distinct tooth at the middle of the inner border. Temples bordered below. (See also **Heterota**, 10.) . . . . . **Pseudatheta**, Cam.
3. Middle and posterior tibiae with at least one long seta. 4.
— Middle and posterior tibiae without long setae, at most with a weak seta. 5.

4. Shining convex species with strongly pointed abdomen. Labial palpi elongate, the 1st joint not constricted at the inner border, and twice as long as the 2nd. Mandibles simple. Facies somewhat resembling **Tachyporus** . **Hetairotermes.** n. n.*
— Rather depressed, dull parallel species, the 1st joint of the labial palpi constricted at the inner border. Right mandible with a tooth . . . **Homalota** Mannerh.
5. Temples not bordered below. 6.
— Temples bordered below. 8.
6. Elytra sinuate. Tongue narrow, elongate, bifid. 1st joint of the labial palpi constricted at the inner border beyond the middle; the 2nd elongate, shorter than the 1st. Head narrowed and rounded behind the eyes . . . **Neomalota** Cam.
— Elytra not sinuate. Tongue bifid or emarginate. 1st joint of labial palpi not constricted at the inner border. Head quadrate. 7.
7. Tongue elongate, bifid. Terminal joint of the tarsi not dilated; 8th dorsal segment of the abdomen toothed at the posterior border. Habitat under bark **Thectura** Thoms.
— Tongue obviate, emarginate anteriorly. Terminal joint of the tarsi dilated; 8th dorsal segment of the abdomen not toothed at the posterior border. Habitat maritime . . . . **Paractocharis** Cam.
8. Head and thorax very finely, very sparingly and obsoletely punctured. Depressed, shining, parallel species . **Lampromalota** Cam.
— Head and thorax distinctly and closely punctured. 9.
9. Tongue simple. 10.
— Tongue elongate, more or less divided or emarginate. 11.
10. Tongue short and broad. 1st joint of labial palpi not constricted at inner border. Elytra not sinuate . . **Placusa** Er.

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* *Termophila* Lea, nom. praeoc.

— Tongue elongate. Labial palpi obscurely 3-jointed . . . . . **Heterota** Rey.

11. 1st joint of labial palpi not constricted at the inner border. 12.

— 1st joint of labial palpi constricted at the inner border . . . . **Chledophila** Cam.

12. 2nd joint of the labial palpi distinctly shorter than the 1st; tongue narrowed at the base, widened towards the apex. Facies of **Homalota** . . . . **Mimomalota** Cam.

— 2nd joint of the labial palpi as long or longer than the 1st. 13.

13. Tongue very narrow, elongate, parallel. Facies of **Placusa** . . . . **Pseudoplacusa** Cam.

— Tongue broader, narrowed at the base, widened towards the apex. Facies of **Neosilusa** . . . . . **Deralia** Cam.

14. Mesosternum finely carinate. 15.

— Mesosternum not carinate. 17.

15. Elytra distinctly sinuate, the sides with 3 long and strong setae. Tongue broad with rounded sides, narrowed at the base, nearly bilobed. Labial palpi 3-jointed, the 3rd joint minute, subulate . . . . . **Adelarthra** Cam.

— Elytra distinctly sinuate, the sides without long setae. Labial palpi 2-jointed. 16.

16. Labial palpi not styliform, the 2nd joint as long as, but narrower than the 1st. Tongue bifid nearly to the base. Right mandible with a small tooth. Facies of **Pseudoligota** . . . **Sternotropa** Cam.

— Labial palpi styliform, the 2nd joint longer than the 1st. Tongue narrow, bifid for half its length. Right mandible with a small tooth. Facies of **Neosilusa** . . . . . **Prosilusa** Cam.

17. Tongue simple. 18.

— Tongue bifid. 20.

18. Tongue short and broad, halberd-shaped, labial palpi 2-jointed, the 1st joint short and broad, the antero-external angle prominent and with a strong seta, the inner border constricted before

the apex; 2nd joint as long as, but much narrower than the 1st. Facies of **Acrotona** . . . . . **Pelekoglossa** Cam.

— Tongue long or moderately long, not halberd-shaped. 19.

19. Labial palpi with the 2nd joint as long as the 1st, styliform . . . . **Neosilusa** Cam.

— Labial palpi with the 2nd joint much shorter than the 1st, not styliform . **Gyrophaena** Mannh.

20. Labial palpi distinctly 2-jointed, the 1st joint without constriction at the inner border; tongue small and triangular, split at the apex; inner lobe of the maxilla truncate and finely pectinate at apex; temples not bordered below. Facies of **Oligota** . . . . **Pseudoligota** Cam.

— Labial palpi obscurely 3-jointed, the 1st joint having a constriction at the inner margin from which a more or less apparent oblique suture passes forwards and outwards; tongue elongate and bifid; inner lobe of maxilla pointed and narrow, the inner margin strongly pectinate; temples bordered below. 21.

21. Last joint of the labial palpi as long as the 1st (true) joint; outer lobe of maxilla simply ciliate at apex. Facies of **Neosilusa** . . . . . **Ousilusa** Cam.

— Last joint of the labial palpi shorter than the 1st (true) joint; outer lobe of maxilla ciliate plumose at apex. 22.

22. Elytra distinctly sinuated at the postero-external angle; middle and posterior tibiae without long setae. Facies somewhat resembling **Gyrophaena** . **Pseudophaena** Cam.

— Elytra not sinuated at the postero-external angle; middle and posterior tibiae with a long seta. Facies somewhat resembling **Homalota** . **Caenonica** Kr.

MYRMEDONIINI.

1. Tarsal formula 4, 5, 5. 2.

— Tarsal formula 4, 4, 4, or 3, 4, 4. 13.

2. Maxillary socket wide and deep, extending to the level of the posterior border of the eye or beyond it. Mesosternum broadly rounded or truncate behind, extending but little between the intermediate coxae; metasternum produced, bordered, not meeting the mesosternum. 3.

— Maxillary socket neither wide nor deep, not extending to the level of the posterior border of the eye. 4.

3. 1st joint of the posterior tarsi twice as long as the 2nd . . . . **Zyras** Steph.

— 1st joint of the posterior tarsi but little longer than the 2nd . . . **Myrmedonota** Cam.

4. Labial palpi distinctly 2-jointed. 5.

— Labial palpi 3-jointed, sometimes (**Paratheta** and **Fenyesia**) obscurely so. 8.

5. Sculpture coarse and rugose . . . **Schistogenia** Kr.

— Sculpture fine, not rugose. 6.

6. Labial palpi almost styliform, the 2nd joint half as long as the 1st. Tongue narrow and elongate, a little widened anteriorly, the apex with a small emargination . . . . . **Exatheta** Cam.

— Labial palpi normal. Tongue split into two lobes. 7.

7. Tongue rather long, split nearly to the base into two narrow diverging lobes. Mesosternal process gradually narrowed, the apex bluntly pointed, the intermediate coxae moderately separated. . . . . **Mimatheta** Cam.

— Tongue rather short and broad, split to the middle into two diverging teat-shaped lobes. Mesosternal process narrow, sharply pointed, the intermediate coxae narrowly separated . **Mimacrotona** Cam.

8. Head with very narrow, distinctly exposed neck; the base of the head not at all concealed by the thorax. 9.

— Head with broad neck; the base of the head more or less concealed by the thorax. 10.

9. 1st joint of the posterior tarsi a little longer than the 2nd; thorax obtusely angled before the middle, the sides strongly contracted and sinuate posteriorly . . . . . **Amaurodera** Fauv.
— 1st joint of the posterior tarsi as long as the three following together; thorax not obtusely angled before the middle . **Falagria** Mann.
10. Labial palpi distinctly 3-jointed. 11.
— Labial palpi obscurely 3-jointed. 12.
11. Tongue short and broad, broadest at the base, emarginate in front . . . **Pelioptera** Kr.
— Tongue longer, narrow at the base, more or less bifid . . . . . **Atheta** Thoms.
12. 1st joint of the posterior tarsi elongate, about twice as long as the 2nd; thorax strongly transverse, convex, the posterior angles acute and produced. Mesosternal process narrow and pointed, the intermediate coxae very narrowly separated . . . . **Fenyesia** Cam.
— 1st joint of the posterior tarsi short, sub-equal to the 2nd; thorax much less transverse, the posterior angles not acute or produced. Mesosternal process broad, truncate posteriorly, keeled longitudinally in the middle line, the intermediate coxae widely separated . . . . . **Paratheta** Cam.
13. Tarsal formula 4, 4, 4. Labial palpi 2-jointed . . . . . **Termitochus** Silvestri.
— Tarsal formula 3, 4, 4. Labial palpi 3-jointed: facies approaching **Falagria** **Eusteniamorpha** Cam.

ALEOCHARINI.

1. Maxillary palpi 5-, labial palpi 4-jointed. 2.
— Maxillary palpi 4-, labial palpi 2-jointed. **Myrmedonella** Cam.
2. Anterior and middle tibiae spinose . **Aleochara**, Gr.
— Anterior and middle tibiae not spinose. 3.
3. Elytra not sinuate at the postero-external angle. Tongue moderately broad, split to the middle into two narrow lobes. 4.

— Elytra strongly sinuate at the postero-external angle. Tongue narrow and elongate, the apex only bifid . . **Hoplandria** Kr.*

4. Thorax with four large punctures placed quadrately on the disc. Species robust, oblong . . . . **Tetrasticta** Kr.

— Thorax without four quadrately placed punctures on the disc. Species more elongate . . . . . **Paraleochara** Cam.

TABLES OF THE SPECIES.

Eleusis Cast.

1. Species black, the elytra testaceous with apical margin narrowly black . . *humilis* Er.

— Species in great part testaceous or reddish-testaceous. 2.

2. Elytra very narrowly infuscate posteriorly. 3.

— Elytra broadly infuscate posteriorly . *lunigera* Fauv.

3. Species smaller (1·6 mm.); head more or less pitchy . . . . . *fusciceps* Kr.

— Species larger (3 mm.); head reddish testaceous . . . . . *kraatzi* Fauv.

Leptochirus Germ.

1. Front of head without impressed line; prosternal process much widened behind (Sub-gen. *Strongylochirus* Bernh.). Clypeus declivous, separated from the front by a transverse line and from the sides by a curved impressed line . . . . . *laevis* cast.

Borolinus Bernh.

1. Red, the elytra and apical part of the abdomen more or less black. Length 8 to 10 mm. . . . (*minutus* Cast.) v. *cruentus* Fauv.

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* Stated by Kraatz (Linn. Ent. 1857, p. 4) to have the anterior tarsi 4-jointed; this is incorrect. The minute accessory joint of the maxillary and labial palpi was also overlooked by this author.

Priochirus Sharp.

1. Front of the head with a tooth in the middle (Sub-gen. *Triacanthus*) and one on either side, all of about equal length; sides of the thorax uniformly punctured; femora pitchy-black. Length 7 to 8 mm. . (*tridens* Motsch.) v. *insularis* Bernh.
— Front of the head with a deep excision in the middle line (Sub-gen. *Cephalomerus* Bernh.). 2.
2. Frontal excision deeper; lateral teeth separated by a broader and deeper excision from the central ones; thorax much more transverse . . . *hoplites* Fauv.
— Frontal excision less deep: lateral teeth separated by a smaller and shallower excision from the central ones; thorax less transverse . . . . *pygmaeus* Kr.

Ancaeus Fauv.

1. Head, thorax and elytra with very indistinct ground sculpture; species testaceous, larger, more shining; thorax much more transverse . . *exiguus* Er.
— Head, thorax and elytra with very distinct longitudinally strigose ground sculpture; species usually pitchy-brown, smaller, less shining; thorax much less transverse . . . (1) *singularis* Cam.

Holosus Motsch.

1. Elytra without elevated lines or keels; facies of *Tachyporus* . . *tachyporiformis* Motsch.
— Elytra each with two elevated lines or keels . . . . . *plicatus* Bernh.

Lispinus Er.

1. Posterior angles of the thorax scarcely impressed. 2.
— Posterior angles of the thorax distinctly impressed. 3.
2. Size larger (3·5 mm.); abdomen distinctly but sparingly punctured; antennae ferruginous . . . . . *coarcticollis* Kr.

— Size smaller (1·7 mm.); abdomen impunctate, antennae testaceous . (3) *minutus* Cam.

3. Disc of each elytron with two rows of large setiferous punctures . . (2) *setosus* Cam.

— Disc of the elytra without rows of large setiferous punctures. 4.

4. Species shining; ground sculpture of the fore-parts very indistinct; disc of thorax distinctly and not sparingly punctured . . . . . (2*a*) *sharpi* Cam.

— Species with greasy lustre only; ground sculpture of the fore-parts very distinct, coriaceous; disc of thorax sparingly punctured. 5.

5. Lateral impression of the thorax deeper, impunctate; antennae shorter, the penultimate joints more transverse . *impressicollis* Motsch.

— Lateral impressions of the thorax shallower. punctured; antennae longer, the penultimate joints less transverse . . . . . *tenuicornis* Kr.

Phloeonomus Heer.

1. Head and thorax opaque, elytra black or pitchy-black, scarcely shining . *obscurus* Kr.

— Head and thorax shining, elytra with the disc testaceous, shining . . *discalis* Cam.

Trogophloeus Mannerh.

1. 5th to the 7th joints of the antennae longer than broad (*Trogophloeus* s.str.). 2.

— 5th to the 7th joints of the antennae not longer than broad (Sub-gen. *Taenosoma*). 3.

2. Eyes very large, occupying nearly the whole of the side of the head; abdomen very thickly covered with fine grey pubescence; species duller, thorax much less strongly contracted at the base . . . . . (4) *orientalis* Cam.

— Eyes moderate, temples longer; abdomen much less thickly pubescent; species more shining, thorax strongly contracted at the base . . . . (5) *silvestris* Cam.

3. Species in great part reddish-testaceous. 4.
— Species entirely or in great part dark. 5.
4. Size larger 1·75 mm., shining, the fore-parts punctured, not shagreened; the diameter of the eyes equal to the length of the temples, and moderately prominent . . . . . (8) *littoralis* Cam.
— Size smaller 1·4 mm., with greasy lustre only, the fore-parts shagreened, not punctured; the eyes small and flat, their diameter much less than the length of the temples . . . (9) *rufotestaceus* Cam.
5. Species smaller, black, nearly opaque, head and thorax shagreened, not punctured . . . . (6) *halophiloideus* Cam.
— Species larger, castaneous, shining, the fore-parts distinctly punctured, not shagreened . . . . . (7) *lucens* Cam.

Aploderus Steph.

1. Rufo-testaceous, shining, finely and sparingly punctured . . . (10) *testaceus* Cam.

Oxytelus Grav.

1. 1st joint of the antennae elongate, constricted before the apex; eyes large, occupying nearly the whole side of the head (Sub-gen. *Caccoporus* Thoms.). 2.
— 1st joint of the antennae only moderately long, gradually thickened and not constricted before the apex. 4.
2. Head black, nearly opaque, not or very obsoletely punctured, densely coriaceous; size larger (4·5 to 5 mm.). 3.
— Head reddish-testaceous, shining, distinctly punctured posteriorly in front, coriaceous; size smaller (2·75 mm.). ♂: 7th ventral segment broadly and feebly emarginate, on each side with a small spine; 6th ventral segment with a small tubercle at posterior margin on each side of the middle line . . . . . *ferrugineus* Kr.

3. Head, thorax and elytra impunctate, densely coriaceous; species less shining. ♂: 7th ventral segment with a deep narrow excision on either side, bounding a central quadrate lobe, this furnished with a tubercle in the middle and with the posterior border a little produced and elevated in the middle line; 6th ventral segment a little produced in the middle and truncate . . . . . *bengalensis* Er.

— Head, thorax and elytra distinctly punctured, thorax and elytra not coriaceous; species more shining. ♂: characters of the preceding, but with the posterior border of the central lobe of the 7th segment broadly emarginate on either side, and the central produced point smaller and sharper . . . . . *nigriceps* Kr.

4. Species black or blackish with dark antennae at most, lighter at the base. 5.

— Species in great part reddish-testaceous or ferruginous with reddish antennae. 8.

5. Head entirely shining, with large and distinct punctures posteriorly; thorax shining, strongly rugose and strigose; size larger (2·6 mm.) . . . *exasperatus* Kr.

— Head impunctate, thorax strigose, not rugose; size smaller (1·5–2 mm.). 6.

6. Sides of the head with a distinct raised line internal to the eyes, extending from the base and continuous with the frontal margin anteriorly; species entirely opaque except the abdomen . *latiusculus* Kr.

— Sides of the head without raised line internal to the eyes 7.

7. Thoracic ridges and front of the head shining, the latter scarcely perceptibly strigose; species somewhat shining. ♂: 7th ventral segment with a small tubercle on either side near the middle and in front of the posterior margin; 6th ventral segment with a moderately

broad, shallow emargination of the posterior border . . . . *pygmaeus* Kr.

— Thoracic ridges completely dull, front of the head scarcely shining, distinctly longitudinally strigose; species opaque (13) *obscurus* Cam.

8. Elytra simply punctured, not strigose, size smaller (1·4 mm.) . . . (12) *frugicola* Cam.

— Elytra distinctly strigose, size larger. 9.

9. Head (except clypeus) and thorax opaque, species dark ferruginous . . . *raffrayi* Fauv.

— Head and thorax shining. 10.

10. Thorax distinctly tri-sulcate. 11.

— Thorax with feeble median sulcus only, the lateral wanting. Head and thorax very finely and sparingly punctured, not rugose . . . . . *thoracicus* Motsch.

11. Head dark brown or black . . . *nitidifrons* Woll.

— Head testaceous or ferruginous. 12.

12. Penultimate joints of the antennae distinctly transverse. Head in part with distinct coriaceous ground-sculpture. ♂: 7th ventral segment truncate . *kraatzi* (*pulcher* Kr.).

— Penultimate joints of the antennae scarcely transverse. Head scarcely at all coriaceous. ♂: 7th ventral segment slightly emarginate on either side . *granadillae* Cam.

Bledius Mannerh.

1. Labrum not emarginate; thorax in the ♂ with a long spine directed forwards (*Bledius* s.str.); species shining, black; antennae and legs testaceous . . *bellicosus* Fauv.

Thinobius Kies.

1. Head smaller than the thorax, eyes moderate (*Thinobius* s.str.). Black, elytra, antennae and legs testaceous . *marinus* Cam.

Paragonus Fauv.

1. Pitchy-black or pitchy-brown; thorax obtusely angulate behind the middle, the sides from thence anteriorly strongly and obliquely contracted, posteriorly strongly arcuate and contracted. Length 2·75 to 3·3 mm. . *heteroceros* Fauv.

Mimogonus Fauv.

1. Cylindrical, black, shining; elytra castaneous; fore-parts with rather large superficial punctures. Length 2·75 mm. . . . . *fumator* Fauv.

Holotrochus Er.

1. Cylindrical, black, shining; head and thorax distinctly, elytra obsoletely punctured. Length 3–3·5 mm. . (14) *nitidus* Cam.

Osorius Latr.

1. Black, shining; head closely and densely longitudinally strigose between the eyes, the sides in front with fine asperate punctures; thorax finely and not very closely punctured. Length 7 mm. . *rugifrons* Er.

Stenus Latr.

1. 4th tarsal joint bilobed; abdomen not bordered (*Hypostenus* Rey). Black, shining, each elytron with a small round orange spot; antennæ elongate, the first two joints testaceous, the following reddish, the 9th to the 11th black; palpi and legs testaceous. Length 5 mm. . . . . ? *bivulneratus* Motsch.

— Elytra without orange spot. 2.

2. Species in great part brown; head with smooth, elevated, longitudinal impunctate space in the middle; antennæ elongate, the first two joints testaceous; legs testaceous, the apex of the femora and base of the tibiæ infuscate . . . . (16) *castaneus* Cam.

— Species black. 3.

3. Head between the eyes flat; species smaller, less shining, less coarsely punctured, antennæ shorter, with the 1st joint pitchy. Length 3·3 mm. . ? *monomeros* Fauv.

— Head between the eyes concave; species larger, shining, more coarsely punctured, antennæ longer, with the 1st joint testaceous. Length 3·75 mm. (15)*fortepunctatus* Cam.

Stenaesthetus Sharp.

1. Brown, sub-opaque, fore-parts strongly and closely punctured, abdomen very finely and closely punctured; antennae and legs testaceous . . . . . *sunioides* Sharp.

Edaphus Le Conte.

1. Rufous; head deeply sulcate between and before the eyes on each side; 2nd abdominal segment carinate, the 3rd bi-fossulate in the middle, 4th and 5th more broadly impressed, the former with a small triangular elevation. Length 1·5 mm. . . . . *dentiventris* Fauv.

Pinophilus Grav.

1. Head with smooth, triangular, shining impunctate space in front; abdomen uniformly grey, pubescent, the centre of the segments not more shining than the sides. Length 5·75–6·5 mm. (16*a*) *orientalis* Cam.

— Head without smooth impunctate space in front; abdomen with the sides of the segments, and especially the 6th, clothed with long golden pubescence, the centre of the segments much more shining than the sides. Length 14 mm. . . . . *borneensis* Fauv.

Neopinophilus Cam.

1. Rufous, shining; head very finely and sparingly punctured; elytra one-third shorter than the thorax. Length 7·8 mm. . . . . (17) *notabilis* Cam.

Eucirrus Fauv.

1. Rufo-ferruginous, shining; head elongate with coarse umbilicate puncturation; thorax elongate; subserially punctured; elytra transverse, shorter than the thorax, strongly and roughly punctured. Length 6·5 mm. . . . . *miricornis* Fauv.

Palaminus Er.

1. Size larger (3·4 mm.); antennae longer, the 4th to the 6th joints fully three times longer than broad; elytra longer . . . . . (18) *bryanti* Cam.
— Size smaller (2·75 mm.); antennae shorter, the 4th to the 6th joints not more than twice as long as broad; elytra shorter . . . . . (18) *parvus* Cam.

Paederus F.

1. Blue-black, thorax and first four abdominal segments red; antennae, palpi and legs (including the coxae) black . *tamulus* Er.

Astenus Steph.

1. Species reddish-testaceous, each elytron with an oblong black spot in the middle; base of the 6th abdominal segment black . . *gracilentus* Fauv. (*gracilis* Kr.)
— Species darker, elytra immaculate; 6th abdominal segment concolorous. 2.
2. Sides of thorax and elytra with strong setae; elytra with moderately large superficial puncturation; abdomen finely punctured . . . . (19) *orientalis* Cam.
— Sides of thorax and elytra with weak setae; elytra with large deep puncturation; abdomen at the bases of the segments rather coarsely and deeply punctured . . . . . (19*a*) *castaneus* Cam.

Stilicopsis Sachse.

1. Sides of the elytra with 3 or 4 long and strong setae; disc of thorax without median longitudinal impression. 2.
— Sides of the elytra without long setae; disc of the thorax with median longitudinal impression . . . (21) *persimilis* Cam.
2. Antennae shorter, the 9th and 10th joints distinctly transverse; thorax broader, species smaller. ♂: 7th ventral segment with a deep acutely triangular excision; 6th with a broad

shallow emargination; 5th with a moderately broad, nearly semi-circular excision in the middle of the posterior border . . . . *breviceps* Fauv.

— Antennae longer, the 9th and 10th joints not transverse; thorax narrower, species larger. ♂: 7th ventral segment with a deep obtusely pointed excision, 6th with a small obtuse excision . (20) *obliqua* Cam.

Stilicus Lat.

1. Ferruginous red, dull, elytra testaceous, shining, with a small brown spot on the reflexed margin at the middle, and a larger one on the disc posteriorly on either side of the suture; abdomen pitchy with copper reflex, sericeous . *ocularis* Fauv.

Psilotrachelus Kr.

1. Black, head shining, moderately finely and closely punctured; thorax dull, closely granulate, with median shining keel; elytra with large punctures more or less in rows, the interspaces finely granulate. Antennae and legs reddish-brown. Length 4·5 mm. . . . *crassus* Kr.

Thinocharis Kr.

1. Head transverse, subquadrate. 2.

— Head not transverse, subovate . . *pygmaea* Kr.

2. Species of darker colour; elytra more closely and distinctly punctured . (22) *nigricans* Cam.

— Species of lighter colour; elytra more sparingly and less distinctly punctured *carinicollis* Kr.

Acanthoglossa Kr.

1. Reddish-brown, clothed with long erect yellow pubescence; head and thorax closely punctured . . . . *hirta* Kr.

Medon Steph.

1. Base of the abdomen keeled below. Eyes moderate or small. 2.

— Base of the abdomen not keeled below. Eyes large. 4.

2. Prothoracic epimera present. Labrum more or less emarginate anteriorly in the middle, with the angles often dentiform. 6.

— Prothoracic epimera wanting. Labrum with a strong tooth in the middle of the emargination which projects a little beyond the anterior border (Sub-gen. *Charichirus*). 3.

3. Antennae entirely reddish-testaceous; legs testaceous; posterior part of the elytra more or less broadly and distinctly rufo-testaceous . . . *chinensis* Boh.

— Antennae black, the last 3 or 4 joints reddish-testaceous; legs pitchy; posterior part of the elytra obscurely dull reddish . . . . (26*a*) *terminalis* Cam.

4. Mandibles 4-dentate (Sub-gen. *Isocheilus*). Species larger (7 mm.), blackish, elytra obscure testaceous, more or less extensively infuscate on the disc . . *staphylinoides* Kr.

— Mandibles with the right 4-dentate, the left 3-dentate (Sub-gen. *Arthocharis*). Species smaller. 5.

5. Head and thorax with distinct smooth median line; species brighter and more shining; abdomen much less thickly punctured and pubescent . *ochracea* Grav.

— Head and thorax without median smooth shining line; species of duller colour, less shining; abdomen much more thickly punctured and pubescent . *uvida* Kr.

6. Gular sutures fused or very narrowly separated (Sub-gen. *Medon* s.str.). 7

— Gular sutures not fused, widely separated. 9.

7. Elytra shining testaceous, the base broadly infuscate; head and thorax bright reddish-testaceous, shining . (23) *rubicundus* Cam.

— Elytra otherwise coloured. 8.

8. Antennae slender, the 5th joint distinctly longer than broad; species smaller (3 mm.); vertex of head simply punctured, a little shining; elytra reddish, largely infuscate posteriorly . (22*a*) *orientalis* Cam.

— Antennae short, the 5th joint scarcely longer than broad; species larger (3·75 mm.), vertex of head granular, not shining; elytra reddish, less infuscate posteriorly . . . *opacellus* Fauv.

9. Sculpture of head and thorax granular; species rufo-testaceous, the elytra more or less infuscate posteriorly . . (26) *granulatus* Cam.

— Sculpture of head and thorax not granular. 10.

10. Head and thorax shining, without visible ground sculpture. 11.

— Head and thorax scarcely shining, with distinct coriaceous ground sculpture and superficial umbilicate puncturation . . . . . *debilicornis* Woll.

11. Elytra testaceous, with broad pitchy transverse fascia; puncturation of thorax fine, not umbilicate . . (24) *fasciatus* Cam.

— Elytra uniform reddish-testaceous; puncturation of thorax moderately coarse, umbilicate . . . . (25) *lucens* Cam.

Parascopaeus Cam.

1. Shining pitchy-brown; head rather coarsely, thorax finely, elytra indistinctly punctured; antennae, mouth-parts and legs testaceous . . (27) *nitidus* Cam.

Scopaeus Er.

1. Antennae dark, the last four or five joints testaceous; species black; length 4 mm. . . . . (28) *niger* Cam.

— Antennae entirely reddish-testaceous; species at least partly testaceous or reddish-testaceous. 2.

2. Size larger (3·6 mm.); 2nd joint of the antennae distinctly shorter than the 3rd . . . . . *testaceus* Motsch.

— Size smaller (2—2·5 mm.); 2nd joint of the antennae not shorter than the 3rd. 3.

3. 3rd joint of the antennae moniliform; under surface of the head deeply

punctured; species red, shining, the elytra testaceous, with transverse indeterminate dark fascia nearer to the posterior margin than to the base. Length 2 mm. . . . . *puncticeps* Kr.

— 3rd joint of the antennae not moniliform; under surface of the head not deeply punctured. 4.

4. Species reddish-testaceous, shining, the elytra in great part infuscate. 5.

— Species pale testaceous, but slightly shining; the elytra entirely pale, exceedingly finely and obsoletely punctured . . . . . *pallidulus* Kr.

5. Elytra infuscate, the posterior margin testaceous; 4th and 5th joints of the antennae a little longer than broad; species larger (2·5 mm.) and more robust . . . . . *limbatus* Kr.

— Elytra testaceous with ill-defined dark fascia situated nearer the posterior border than the base; 4th and 5th joints of the antennae moniliform; species smaller (2 mm.). Very similar to *puncticeps* . . . . . *micros* Kr.

Calliderma Motsch.

1. Thorax (except for parts of the elevated lines) entirely opaque, densely punctured . . . . . (29) *rufum* Cam.

— Thorax entirely shining. 2.

2. Thorax red, impunctate . . . (30) *nitens* Cam.

— Thorax red, with transverse dark fascia; in part coarsely and rugosely punctured . . . . . (31) *rugicolle* Cam.

Cryptobium Mannerh.

1. Eyes very small; form narrow and elongate; legs reddish; size smaller (7 mm.). 7th dorsal segment with substrigose sculpture . . . *filum* Kr.

— Eyes moderate; form broader; legs pale testaceous; size larger (8·5 mm.). 7th dorsal segment simply punctured . (32) *foveatum* Cam.

Oligolinus Cas.

1. Black, shining; antennae, mouth-parts and legs reddish-testaceous, the middle and posterior tibiae more or less infuscate . . . . . (33) *parvus* Cam.

Leptacinus Er.

1. Black, shining; thorax reddish or pitchy, with a dorsal series of 5 or 6 large punctures; elytra pale testaceous, the base and apex somewhat infuscate. Length 4 mm. . . . . *tricolor* Kr.

Somoleptus Sharp.

1. Shining, head and abdomen black, thorax and elytra pitchy-brown, the latter finely and sparingly punctured. Length 3 mm. . . . . (34) *linearis* Cam.

Eulissus Mannerh.

1. Black, shining; elytra and abdomen pitchy, the disc of the former obscure, the side margins of the latter clear testaceous . . . . . (35) *lateralis* Cam.

Thyreocephalus Guer.

1. Shining bronze-green or coppery-bronze, the elytra and 3rd and 4th (visible) segments of the abdomen bright reddish; the last six joints of the antennae and legs testaceous. Length 10·5–15 mm. . . . . *annularis* Fauv.

Diochus Er.

1. Pitchy-black, shining; thorax entirely, apex of the elytra broadly, reddish-testaceous; abdomen pitchy-red, the apex testaceous. Antennae, mouth-parts and legs testaceous. Length 3 mm. . . . . (36) *pulchellus* Cam.

Holisomimus Cam.

1. Abdomen unicolorous pitchy-brown. Length 2–3 mm. . . . . (37) *parvus* Cam.

— Abdomen in part reddish-testaceous. Length 1·75 mm. . . . . (38) *cingulatus* Cam.

Actobius Fauv.

1. Black, shining; antennae and legs fuscous, the first two joints of the former and the femora testaceous. Length 4 mm. . . . . (39) *laticeps* Cam.

Philonthus Curtis.

1. Last joint of the labial palpi not longer than the preceding; head oblong (Subgen. *Gabrius*). 13.
— Last joint of the labial palpi longer than the preceding. 2.
2. Thorax on either side of the middle line with a row of three punctures,* elytra with a double series of large punctures, two sutural and three or four subhumeral. Length 6–9 mm. . . *notabilis* Kr.
— Thorax on either side of the middle line with a row of more than three punctures. 3.
3. Thorax on either side of the middle line with a row of four punctures; head suborbiculate; 1st joint of the antennae, coxae and legs testaceous, the tibiae often infuscate; abdomen slightly iridescent. Length 6–8·5 mm. *delicatulus* Boh.
— Thorax on either side of the middle line with a row of five punctures. 4.
4. Antennae entirely rufo-testaceous; thorax and elytra castaneous-red; abdomen pitchy; legs testaceous. Length 6 mm. . . . . (41) *castaneipennis* Cam.
— Antennae dark, at most with the base and more or less of the apex lighter. 5.
5. Antennae with the base and at least the terminal joint reddish-testaceous, the penultimate joints strongly transverse. 6.
— Antennae with the base at most lighter. 7.
6. Antennae with the base and terminal joint rufo-testaceous; elytra entirely black. Length 3·75 mm. . . *crassicornis* Fauv.

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* Erichson's notation.

— Antennae with the base and last four or five joints reddish-testaceous; elytra with the base, suture and apical margin red. Length 6 mm. . . . *circumductus* Fauv.

7. Head small, narrow, oval; thorax narrowed in front. Length 6·5–7·5 mm. . . . . *longiceps* Fauv.

— Head subquadrate or suborbicular. 8.

8. Penultimate joints of the antennae distinctly transverse. 9.

— Penultimate joints of the antennae not or scarcely transverse. 10.

9. Elytra bronze-green, the suture narrowly reddish; 1st joint of the antennae pitchy-testaceous; elytra and abdomen more sparingly punctured. Length 8 mm. . . . . *aenicipennis* Boh.

— Elytra black, the suture and apical margin narrowly reddish; first two joints of the antennae clear reddish-testaceous; elytra and abdomen much more closely punctured. Length 5·75 mm. . . . . *flavocinctus* Motsch.

10. Head sub-quadrate. Species black, the sides of the elytra and posterior margins of the dorsal abdominal segments concolorous. Length 8–8·5 mm. . (42) *belonuchoides* Cam.

— Head suborbicular. 11.

11. Base of the first three visible dorsal segments of the abdomen with a large puncture on either side of the middle line; elytra and abdomen black, concolorous; size smaller. Length 6 mm. *gemellus* Kr.

— Base of the first three visible dorsal segments of the abdomen without large puncture on either side. Size larger (8·5 mm.). 12.

12. Front of the head between the antennal tubercles with a short, deep, longitudinal sulcus in the middle line; diameter of the eyes viewed from above rather less than the length of the temples; 1st joint of the posterior tarsi scarcely longer than the last. Length 6·5–7 mm. (40) *sulcatus* Cam.

— Front of head without sulcus; the diameter of the eyes viewed from above much greater than the length of the temples; 1st joint of the posterior tarsi distinctly longer than the last . . . . . *geminus* Kr.

13. Elytra pitchy, the apex and suture reddish-testaceous; penultimate joints of the antennae scarcely transverse . *pulchellus* Kr.

— Elytra uniformly fusco-testaceous; penultimate joints of the antennae distinctly transverse . . . *maritimus* Motsch.

Orthidus Muls and Rey.

1. Shining brassy-bronze; elytra copper-bronze; antennae, mouth-parts and legs ferruginous. Length 10 mm. (43) *cupreipennis* Cam.

Cafius Steph.

1. Thorax with a narrow, shining, impunctate, median line; the rest of the surface closely and uniformly punctured; size larger (8 mm.) . *nauticus* Fairm.

— Thorax, with broader shining, impunctate median area, on either side with a row of 14 or 15 punctures, the sides more or less closely punctured; size smaller (5·5 mm.) . . . . . *corallicola* Fairm.

Hesperus Fauv.

1. Black, shining; thorax, base of the elytra, 3rd and 4th visible abdominal segments and first three joints of the antennae, red; apical border of the elytra and of the 5th visible abdominal segment, last three or four joints of the antennae and the legs, pale testaceous. Length 8–8·5 mm. . . . . *laevigatus* Fauv.

Belonuchus Nordm.

1. Species entirely black . . . . *mutator* Fauv.

— Species not entirely black, the elytra with bronze-green reflex; antennae with the first three and last two joints testaceous . . . . . *aeneipennis* Fauv.

Acylophorus Nordm.

1. Black, shining; abdomen iridescent; thorax with the sides strongly rounded, the disc with a single puncture on either side of the middle line. Length 6–7 mm. . . . . (44) *rotundicollis* Cam.

Delibius Fauv.

1. Obscure rufo-testaceous, rather shining; head posteriorly, disc of the elytra and middle of the abdomen more or less infuscate. Length 3 mm. . . *longicornis* Fauv.

Megarthropsis Cam.

1. Elongate, fusiform, moderately shining, black, the sides and posterior half of the thorax, abdomen and legs reddish-testaceous; antennae long and slender, obscure testaceous, the middle joints infuscate. Length 4 mm. . . . (45) *decorata* Cam.

Atanygnathus Jacobson.

1. Black, shining, the thorax, posterior margins of the elytra and of the abdominal segments red; base and apex of the antennae and legs testaceous . . . . . *terminalis* Er.

Conosoma Kr.

1. Sides of the elytra without setae. 2.
— Sides of the elytra with long setae. 11.
2. Species entirely or in great part black or reddish-brown. 3.
— Species in great part bright reddish-testaceous. 10.
3. Elytra with a more or less distinct macula at the base of each. 4.
— Elytra immaculate at the base. 5.
4. Each elytron with a reddish, ill-defined spot at the middle of the base, not extending to the lateral margin; posterior margin and postero-external angles of the thorax rufescent . 46 (*a*) *malayanum* Cam.

— Each elytron with a rounded, well-defined yellow spot at the middle of the base; posterior angles of the thorax yellow . . . . . (48) *flavoguttatum* Cam.

5. Antennae very long and slender, the joints not appreciably compressed . (50) *championi* Cam.

— Antennae shorter, the joints distinctly compressed. 6.

6. Abdomen shining; species shining, much less thickly punctured and pubescent . (49) *abdominale* Cam.

— Abdomen dull; species more opaque, much more thickly punctured and pubescent. 7.

7. Species larger and more robust. Length 5 mm. . . . . (46) *robustum* Cam.

— Species smaller and less robust. Length 3–3·5 mm. 8.

8. Pectinations of the anterior tibiae on the outer border testaceous; posterior third of the elytra obscurely reddish . . . . . (51) *walkeri* Cam.

— Pectinations of the anterior tibiae on the outer border, black; elytra unicolorous. 9.

9. Species larger and broader; black. Length 3·5 mm. . . . . *ceylanense* Kr.

— Species smaller and narrower; reddish-brown . . . . . (47) *rufobrunneum* Cam.

10. Base of the thorax with a black, subtriangular spot on either side of the middle line (sometimes united); base of the elytra broadly, and apex narrowly, rufo-testaceous; 4th visible abdominal segment (except the posterior border) black . . . . *suave* Fauv.

— Base of the thorax immaculate; elytra obscurely darker posteriorly; abdomen concolorous . . . . . (52) *perplexum* Cam.

11. Base of the thorax with a black spot on either side of the middle line; elytra with a black fascia extending from the lateral margin nearly to the suture; 6th to the 10th joints of the antennae black . . . . . (53) *nigromaculatum* Cam.

— Base of the thorax immaculate, elytra without dark fascia; 6th to the 10th joints of the antennae scarcely infuscate . . . . . (54) *rufotestaceum* Cam.

Tachinomorphus Kr.

1. Last joint of the antennae testaceous, the penultimate joints much less transverse . . . . . *fulvipes* Er.
— Last joint of the antennae black, the penultimate joints strongly transverse *ceylonicus* Bernh.

Coproporus Kr.

1. Antennae entirely testaceous. 2.
— Antennae at least in part dark. 3.
2. 4th joint of antennae longer than broad, the penultimate joints scarcely transverse; head and thorax entirely impunctate; species smaller (1·75 mm.), rufo-testaceous . . . . (57) *parvulus* Cam.
— 4th joint of the antennae distinctly transverse, the penultimate joints distinctly transverse; head and thorax exceedingly finely punctured; species larger (2·2 mm.), black, pitchy or more or less rufo-testaceous . . . . (56*a*) *varians* Cam.
3. 5th joint of the antennae strongly transverse; elytra finely but distinctly punctured; species minute. Length 1 mm. . . . . *atomus* Kr.
— 5th joint of the antennae not transverse; species larger. 4.
4. 5th joint of the antennae distinctly longer than broad. 5
— 5th joint of the antennae as long as broad. 9.
5. Head clear reddish-testaceous; species in great part reddish-testaceous. 6.
— Head black or pitchy-red. 7.
6. Elytra testaceous-yellow without dark markings . . . . . *secretus* Bernh.
— Elytra testaceous-yellow at the base, with a large black spot not extending to the suture or the lateral margin . . *fasciipennis* Kr.

7. Elytra testaceous . . . . (56) *flavipennis* Cam.
— Elytra dark. 8.
8. Head, thorax and elytra without trace of puncturation; head and abdomen reddish; species larger and more convex. Length 4·5 mm. . . . . (55) *rufiventris* Cam.
— Head, thorax and elytra finely but distinctly punctured; head and abdomen black; species smaller and more depressed. Length 2·75 mm. . . *subdepressus* Kr.
9. Thorax before the base with a large puncture on either side of the middle line, otherwise completely impunctate; elytra distinctly punctured; size larger and more convex. Length 3 mm. . . . . *brunneicollis* Motsch.
— Thorax without large punctures before the base, scarcely perceptibly punctured; elytra exceedingly finely punctured; size smaller and more depressed. Length 1·75 mm. . . *minimus* Motsch.

Leucoparyphus Kr.

1. Black, shining, the margins of the thorax, base, shoulders, postero-external angles and apical margins of the elytra testaceous. Length 2·75–3 mm. . . *silphoides* L.

Mimocyptus Cam.

1. Convex, shining ferruginous-red, the foreparts impunctate, the abdomen scarcely perceptibly punctured; antennae with the first four joints and apex of the last, mouth-parts and legs testaceous. Length 1·2 mm. (in well-extended examples) . . . (58) *globulus* Cam.

Adinopsis Cam.

1. Minute, obscure reddish-brown, densely and finely punctured and pubescent; antennae, mouth-parts and legs testaceous. Length 1·2 mm. . . (59) *rufo-brunnea* Cam.

Leucocraspedum Kr.

1. Black, convex, shining, acuminate posteriorly; antennae stout, testaceous; the last two joints infuscate; legs pitchy-testaceous. Length scarcely 3 mm. . . . . (60) *nigrum* Cam.

Myllaena Er.

1. Narrow, elongate, acuminate, blackish; the thorax, elytra, posterior margins of the first four visible and the whole of the last two abdominal segments reddish-testaceous; antennae, mouth-parts and legs clear testaceous. Length 3·4 mm. . . . . (61) *faberensis* Cam.

Pronomaea Er.

1. Chestnut brown, rather shining, the fore-parts finely and closely punctured; antennae fuscous, the first two joints, palpi and legs testaceous. Length 3 mm. . . . . (62) *leontopolitana* Cam.

Diglotta Champ.

1. Linear, pitchy; abdomen black, scarcely shining, densely and finely pubescent; antennae, elytra, legs and last abdominal segment testaceous. Length 1·5 mm. . . . . (63) *testaceipennis* Cam.

Oligota Mannerh.

1. Black, elytra pitchy-brown, apex of abdomen rufescent. Length scarcely ·75 mm. . . . . (64) *moultoni* Cam.

— Entirely testaceous. Length ·75 mm. . (65) *forticornis* Cam.

Pseudoligota Cam.

1. Last seven joints of the antennae infuscate; species narrow and less robust; length 1 mm. ♂: sutural margin of the elytra posteriorly with four or five minute tubercles on either side; spine of the 8th abdominal segment furnished with yellow setae . . . . (66) *varians* Cam.

— Last seven joints of the antennae black; species broader and more robust; length 1·1 mm. ♂: sutural margin of the elytra posteriorly with a small tuberele on either side and sometimes with traces of two others in front; spine of 8th abdominal segment without setae . . . . . (61) *robusta* Cam.

Gyrophaena Mannerh.

1. Species larger (2·5–3 mm.), thorax and greater part of the abdomen bright reddish-testaceous. ♂: sides of 4th (visible) dorsal segment with a narrow plate pointed at apex; 7th with a row of six small tubercles placed transversely across the middle; 8th trifid, the lateral lobes broader than the median . . . . . *appendiculata* Motsch.
— Species smaller (·5–2·5 mm.), coloration more obscure, pitchy or metallic, with elytra and base of the abdomen often more or less obscure testaceous. ♂ without lateral appendage to the 4th dorsal segment. 2.
2. Head strongly transverse, eyes very prominent (*Gyrophaena* s.str.). 3.
— Head much less transverse, eyes less prominent (Sub-gen. *Phaenogyra* Rey). Species with copper-bronze metallic reflex on the fore-parts. ♂: 7th dorsal segment with obsolete tubercle on either side of the middle line in front of the posterior border; 8th dorsal segment with a rather slender, slightly incurved spine on either side, the border between with two minute teeth separated by a feeble emargination and much nearer to the lateral spines than to each other . . . . (76) *metallica* Cam.
3. Thorax with a row of two or more larger punctures on either side of the disc. 4.
— Thorax without distinct row of larger punctures on either side of the disc,

which is either irregularly or scarcely at all punctured. 7.

4. Antennae entirely testaceous; species small ·5–1·75 mm. 5.

— Antennae with the last joints black, average size larger (1·5–2·5 mm.). ♂: 8th dorsal segment with a median stout spine and on either side a slightly curved, pointed tooth projecting a little beyond the level of the apex of the median spine and separated from it by a semicircular excision . (68) *tridentata* Cam.

5. 5th joint of the antennae not transverse, size larger (1·75 mm.). ♂: 7th dorsal segment with a very obsolete row of six tubercles; 8th with a large flat central tubercle at the base, the posterior margin on either side with a feeble emargination, so that it presents three rounded crenulations, the central one being the largest and most prominent . . . . (70) *crenulata* Cam.

— 5th joint of the antennae transverse, size smaller (·5–1·2 mm.). 6.

6. Head and thorax with fine transverse, strigose ground-sculpture. Length 1·2 mm. ♂: 7th dorsal segment with a curved, transverse row of six small tubercles, of which the central pair are considerably larger, the lateral sometimes more or less obsolete; 8th narrowed and slightly emarginate on either side, so as to form three short processes, the central one bluntly rounded, wider and more produced than the lateral, which are triangular . (69) *granulosa* Cam.

— Head and thorax without ground-sculpture. Length ·6 mm. ♂: postero-external angles of the elytra with a strong, raised oblique crest; 8th dorsal segment narrowed and rounded (71) *cristata* Cam.

7. Thorax exceedingly finely and sparingly punctured, ground-sculpture distinct, transversely strigose. ♂: 8th dorsal

segment produced on either side into a rather stout, slightly incurved spine, the posterior margin between these bisinuate . . . . . (72) *bidens* Cam.

— Thorax distinctly punctured; ground-sculpture absent or very indistinct. 8.

8. Elytra exceedingly finely and exceedingly sparingly punctured; middle of the disc of thorax impunctate . . (73) *dubia* Cam.

— Elytra finely, but not exceedingly sparingly punctured; middle of the disc of thorax punctured. 9.

9. Thorax finely and uniformly punctured. ♂: dorsal segment with a flat, semi-circular tubercle in front of the posterior margin in the middle; 8th with a small triangular excision on either side of the middle of the posterior border, so that a short, blunt, triangular process is formed in the middle and the lateral margins project as sharp triangular teeth . . . . . (75) *moultoni* Cam.

— Thorax with unequal, irregular punctures on the disc, the sides impunctate. ♂: 8th dorsal segment with a short, stout, blunt, slightly incurved tooth on either side . . . . . (74) *irregularis* Cam.

Sternotropa Cam.

1. Species black, the elytra often chestnut-brown. ♂: 8th dorsal segment with a pointed tooth on either side, separated by a nearly semi-circular emargination . . . . . (77) *nigra* Cam.

— Species black, the thorax, base and apex of the abdomen reddish-testaceous. ♂: suture of the elytra with a row of three obsolete tubercles towards the posterior part; 7th dorsal segment with a minute tubercle on either side of the middle line in front of the posterior margin; 8th with a moderately long, pointed, slightly incurved tooth on either side . . . . . (78) *ruficollis* Cam.

Adelarthra Cam.

1. Shining dark pitchy-red; elytra pitchy-black; 3rd, 4th and 8th abdominal segments reddish-testaceous. Length 1·2 mm. . . . . (79) *barbara* Cam.

Hetairotermes, n.n.

1. Disc of the elytra glabrous, the sides and postero-external angles finely and moderately closely punctured . . (80) *agilis* Cam.
— Disc of the elytra uniformly but sparingly punctured . . . . . (81) *piceus* Cam.

Pseudatheta Cam.

1. Rufo-testaceous, the elytra (except the base), posterior half of the 5th and whole of the 6th abdominal segments black. Length 1·75 mm. . . . (82) *elegans* Cam.

Pelekoglossa Cam.

1. Pitchy, moderately shining, the thorax, base and apex of the abdomen obscure reddish-testaceous; first three joints of the antennae fusco-testaceous . (83) *cingulata* Cam.

Placusa Er.

1. 5th joint of the antennae as broad as long; species larger (2 mm.), pitchy, elytra testaceous, infuscate at the scutellum. ♂: 8th dorsal segment of the abdomen finely crenulate; 6th ventral segment narrowed and produced . . . . . (84) *conura* Cam.
— 5th joint of the antennae distinctly transverse, species smaller (1 to 1·6 mm.). 2.
2. First three joints of the antennae clear testaceous; species larger (1·6 mm.) and more robust; thorax pitchy, elytra obscure testaceous. ♂: 8th dorsal segment deeply excised on either side, the lateral margin forming a long, sharp, incurved spine, the central portion forming a lobe with rounded apex furnished with a broad, flat tubercle on the disc . . . (85) *bispina* Cam.

– First three joints of the antennae pitchy-testaceous; species smaller (1—1·2 mm.) and narrower. 3.

3. Thorax black, more than half as broad again as long, species less finely punctured. ♂: 8th dorsal segment as in *bispina*, but the central lobe without tubercle . . . . . (86) *lobata* Cam.

— Thorax pitchy, one-third as broad again as long; species more finely punctured. ♂: 8th dorsal segment with three equal and closely placed teeth at the middle of the posterior border, which is deeply emarginate on either side, the emargination bounded externally by a long, sharp, incurved spine; 3rd dorsal segment variable, either (1) the posterior border triangularly produced in the middle into a lobe with rounded apex, broadly emarginate on either side, the emargination bounded externally by a stout spine extending nearly to the level of the posterior border of the 4th segment, or (2) the posterior margin only slightly produced into a broader lobe emarginate posteriorly, otherwise as in (1) or (3), the posterior margin not at all produced and the lateral spines shorter and broader . (87) *notabilis* Cam.

Pseudoplacusa Cam.

1. Rufo-testaceous, moderately shining, head and elytra pitchy-black; antennae reddish-testaceous. Length 2·1 mm. . . . . (88) *rufiventris* Cam.

Chledophila Cam.

1. Narrow, elongate, scarcely shining, rufo-testaceous, the head pitchy-red; elytra, 6th abdominal segment and last seven joints of the antennae fuscous. Length 2·1 mm. . . . . (89) *annularis* Cam.

Neosilusa Cam.

1. Head and thorax less shining, the puncturation finer but more rugose . . *ceylonica* Kr.
— Head and thorax more shining, the puncturation coarser but less rugose . (90) *moultoni* Cam.

Ousilusa Cam.

1. Head coarsely and closely punctured, sides of the thorax exceedingly finely punctured, the disc (except posteriorly) with moderately fine umbilicate puncturation; elytra very coarsely and deeply punctured . . . (91) *myrmecobia* Cam.
— Head finely, superficially and closely punctured; thorax finely and uniformly punctured; elytra superficially sculptured with larger and smaller punctures . . . . . (92) *castanea* Cam.

Prosilusa Cam.

1. Rufo-castaneous, shining, finely punctured; the elytra in great part, and the base of the 6th abdominal segment, pitchy-black. Antennae, mouth-parts and legs reddish-testaceous . . (93) *rufa* Cam.

Deralia Cam.

1. Pitchy-black, moderately shining; thorax and abdomen (except the 5th and 6th segments, which are pitchy) rufo-testaceous; antennae fuscous, the first three joints and apex of the last mouth-parts and legs testaceous . . (94) *fuscipennis* Cam.

Pseudophaena Cam.

1. Rufo-castaneous, shining; elytra strongly punctured; first three joints of the antennae, mouth-parts and legs reddish-testaceous, the anterior and apex of the intermediate and posterior tibiae pitchy. Length 1·8 mm. . . . (95) *castanea* Cam.

Coenonica Kr.

1. Thorax pitchy-red, the sculpture consisting of granules . . . . (97) *stricticollis* Cam.

— Thorax black, the sculpture consisting of punctures. 2.

2. Head between the antennal tubercles smooth and shining; thorax broader, more shining, less closely punctured . *puncticollis* Kr.

— Head between the antennal tubercles coarsely punctured; thorax narrower, less shining, more closely punctured . (96) *angusticollis* Cam.

Mimomalota Cam.

1. Species dark; size larger and more robust (98) *bispina* Cam.

— Species in great part testaceous; size smaller and less robust . . . (99) *testacea* Cam.

Neomalota Cam.

1. Pitchy or reddish-brown, the elytra black, the abdomen reddish-testaceous, with the 6th segment blackish . . . (100) *cingulata* Cam.

Lampromalota Cam.

1. Depressed, shining; head and thorax very finely and sparingly punctured; elytra and abdomen fusco-testaceous (101) *brunneicollis* Cam.

Homalota Mannerh.

1. Antennae in great part black or infuscate. 2.

— Antennae clear reddish-testaceous. 7.

2. Elytra more or less testaceous. 3.

— Elytra dark. 5.

3. Thorax reddish-brown; size larger (2 mm.); 6th and 7th abdominal segments much more sparingly punctured than the preceding . . . . *platygaster* Kr.

— Thorax black; size smaller; 6th and 7th abdominal segments similarly punctured to those preceding. 4.

4. Head and thorax dull, densely coriaceous, the puncturation confused with the ground-sculpture; elytra fusco-testaceous . . . . . *tuberculicollis* Kr.

— Head and thorax a little shining, less coriaceous, the puncturation more distinct from the ground-sculpture; elytra clear testaceous . . . (102) *nitescens* Cam.

5. 4th joint of the antennae longer than broad, the penultimate joints scarcely transverse; size larger (2 mm.) . . (105) *fuscipennis* Cam.
— 4th joint of the antennae distinctly transverse, the penultimate joints strongly transverse; size smaller. 6.
6. Abdomen reddish-testaceous, the 6th segment pitchy; posterior angles of the thorax forming a minute tooth . (104) *cingulata* Cam.
— Abdomen black, the posterior half of the 7th and the 8th segment reddish-testaceous; posterior angles of the thorax not forming a tooth . . (103) *bidens* Cam.
7. 4th joint of the antennae square, size smaller (1·75 mm.) . . . . *variventris* Kr.
— 4th joint of the antennae distinctly transverse; size larger (2–2·4 mm.). 8.
8. Larger and more robust; fore-parts more coarsely punctured; length 2·4 mm. ♂: 8th dorsal segment emarginate on either side, the emargination bounded externally by a rather long, sharp tooth, the posterior border between the emarginations with eight sharp teeth . . . . (107) *denticulata* Cam.
— Smaller and less robust; fore-parts more finely sculptured; length 2 mm. ♂: 8th dorsal segment with a feeble emargination on either side, bounded externally by a small tooth, the posterior border between the emarginations finely serrate . . . . (106) *serrata* Cam.

Thectura Thoms.

1. Rather shining; head black, thorax pitchy-brown, elytra and 5th and 6th abdominal segments pitchy, the rest of the latter reddish-testaceous. Length 1·6 mm. . . . (108) *brunneicollis* Cam.

Heterota Rey.

1. Black, with greasy lustre; elytra with indeterminate orange spot occupying the sutural region towards the apex;

antennae, mouth-parts and legs reddish-testaceous . . . . . (109) *arenaria* Cam.

Paractocharis Cam.

1. Very narrow, elongate, fragile, depressed; obscure brown, head and abdomen black; antennae and legs testaceous. Length 1·4 mm. . . . . *fucicola* Cam.

Falagria Mannerh.

1. Thorax cordiform; the sides and base not bordered; the elytra with a distinct impression internal to the shoulders (Sub-gen. *cardiola* Muls and Rey); species ferruginous, pubescence erect . *vestita* Boh.
— Thorax not cordiform; the sides and base finely bordered; the elytra without impression internal to the shoulders. 2.
2. Scutellum on either side with a raised line following the lateral border and united at the apex, the base more or less keeled; species larger (2·8–3 mm.). 3.
— Scutellum without raised line at the lateral borders, the base not keeled; species smaller (1·75 mm.). 5.
3. Head and thorax shining. 4.
— Head and thorax dull; antennae very slender, all the joints much longer than broad; postero-external angles of the thorax acute, prominent . . . (110) *tenuicornis* Cam.
4. Postero-external angles of the thorax prominent, acute; antennae stouter, the 10th joint scarcely as long as broad (111) *brevicornis* Cam.
— Postero-external angles of the thorax not prominent, obtuse; antennae much more slender, the 10th joint much longer than broad . . . *dimidiata* Motsch.
5. Pitchy-black; vertex of head not sulcate; antennae brown, the base reddish-testaceous; elytra fusco-testaceous . *pygmaea* Kr.
— Black; vertex of head with deep longitudinal sulcus; antennae entirely dark; elytra testaceous with base infuscate . . . . . (112) *flavipennis* Cam.

Amaurodera Fauv.

1. Head and elytra shining, brown, very finely and sparingly punctured, thorax reddish-brown, opaque, strongly shagreened; 2nd to 4th segments of the abdomen testaceous, the rest black . . . . . *veluticollis* Motsch.

Eusteniamorpha Cam.

1. Rufo-castaneous, moderately shining, the 6th abdominal segment pitchy-black; thorax and abdomen strongly constricted at their base . . . (113) *rufa* Cam.

Pelioptera Kr.

1. Antennae with the first three joints reddish-testaceous. Species shining; size larger (2–2·75 mm.) . . . *micans* Kr.
— Antennae entirely dark. Species with greasy lustre only; size smaller (1·75 mm.) . . . . . *opaca* Kr.

Atheta Thoms.

1. Abdomen more or less pointed posteriorly. 12.
— Abdomen parallel-sided. 2.
2. Antennae with the penultimate joints not or scarcely transverse. 3.
— Antennae with the penultimate joints distinctly transverse. 5.
3. Abdomen glabrous; Species bright reddish-testaceous, the 5th, 6th and anterior part of the 7th abdominal segments black . . . . (121) *miriventris* Cam.
— Abdomen finely and uniformly punctured. 4.
4. Species dark; elytra uniformly pitchy-brown or pitchy-black . . . (115) *alophila* Cam.
— Species reddish; elytra pitchy, the base and apical margin testaceous; 5th, 6th and anterior part of the 7th abdominal segments black . . (114) *moultoni* Cam.
5. 3rd joint of the antennae scarcely shorter than the 2nd; species larger (2·5 mm). *dilutipennis* Motsch.

— 3rd joint of the antennae distinctly shorter than the 2nd; species smaller (1·3–1·75 mm.). 6.

6. Head and thorax with metallic copper-bronze reflex . . . . (120) *purpurascens* Cam.

— Head and thorax without metallic reflex. 7.

7. Species in great part testaceous, the head and 5th and 6th abdominal segments black . . . . . *putridula* Kr.

— Species obscurely coloured, black, pitchy or brown. 8.

8. Thorax slightly transverse . . . (116) *picea* Cam.

— Thorax distinctly transverse. 9.

9. Antennae lighter at the base. 10.

— Antennae entirely dark. 11.

10. Species shining, more depressed; 4th joint of the antennae but slightly broader than long. ♂: 8th dorsal segment of the abdomen truncate; 6th ventral segment produced, narrowed and rounded at the apex . . . (118) *malayana* Cam.

— Species with greasy lustre only, less depressed; 4th joint of the antennae distinctly transverse. ♂: 8th dorsal segment of the abdomen truncate on either side with a small tooth . *inutilis* Kr.

11. Intermediate tibiae with a distinct seta near the middle. ♂: 8th dorsal segment of the abdomen truncate; 6th ventral segment a little produced, narrowed and rounded . . . (119) *vulgaris* Cam.

— Intermediate tibiae without distinct seta; ♂: 8th dorsal segment of the abdomen with deep and broad semicircular emargination of the posterior borders. (117) *melata* Cam.

12. Sides of the thorax uniformly rounded, the lateral setae feeble or absent, the epipleurae not visible when viewed laterally; abdomen in some thickly punctured and pubescent throughout. 17.

— Sides of the thorax contracted behind, the lateral setae distinct; the epipleurae visible when viewed laterally;

abdomen always more sparingly punctured behind. 13.

13. 3rd joint of the antennae distinctly shorter than the 2nd; species smaller (1–1·2 mm.) Sub-gen. *Datomicra* Rey. 14.

— 3rd joint of the antennae not shorter than the 2nd; species larger (1·8–2·5 mm.). Sub-gen. *Dimetrota* Rey. 15.

14. Antennae entirely dark; thorax closely and asperately punctured; species uniformly dark . . . . (125) *onthophila* Cam.

— Antennae with the first two joints testaceous; thorax finely and not asperately punctured; thorax, base of the elytra, base and apex of the abdomen more or less pitchy-red . . . (126) *mycetophila* Cam.

15. 7th joint of the antennae longer than broad . . . . . (124) *mycetophaga* Cam.

— 7th joint of the antennae distinctly transverse. 16.

16. Abdomen in great part reddish-testaceous; thorax pitchy-red . . (122) *carpophila* Cam.

— Abdomen and thorax black . . . (123) *xylophila* Cam.

17. Abdomen thickly punctured and pubescent throughout (Sub-gen. *Colpodota* Rey). Pitchy, greasy-lustrous, elytra testaceous, infuscate at scutellum; penultimate joints of antennae as long as broad . . . . . (127) *ruparia* Cam.

— Abdomen much less thickly punctured and pubescent, especially behind (Sub-gen. *Acrotona* Rey). 18.

18. Head black; abdomen reddish-testaceous, intermediate and posterior tibiae each with two distinct setae . . . (128) *rufiventris* Cam.

— Head testaceous; 6th abdominal segment blackish; intermediate and posterior tibiae without distinct setae . . *annuliventris* Kr.

Exatheta Cam.

1. Puncturation of the thorax very fine, not asperate; ground sculpture wanting . . . . . (129) *cingulata* Cam.

— Puncturation of the thorax fine, asperate; ground-sculpture visible . . . (130) *consors* Cam.

Mimatheta Cam.

1. Black, moderately shining; elytra obscure testaceous, more or less infuscate at the sides; first three joints of the antennae mouth-parts and legs, testaceous. Length 2 mm. . . (131) *fungicola* Cam.

Mimacrotona Cam.

1. Rufo-testaceous, moderately shining; the head, 5th, 6th and base of the 7th abdominal segments blackish; the elytra more or less infuscate; first three joints of the antennae, mouth-parts and legs testaceous. Length 1·2 mm. . . . . (132) *cingulata* Cam.

Paratheta Cam.

1. Black, rather shining; the elytra castaneous-brown; first three joints of the antennae and legs reddish-testaceous. Length 2 mm. . . . (133) *carnivora* Cam.

Fenyesia Cam.

1. Black, shining, robust, convex; last two joints of the antennae and legs testaceous, the femora infuscate. Length 2 mm. . . . . (134) *nigra* Cam.

Termitoptochus Silv.

1. ♀: Reddish, elongate, laevigate; abdomen inflated, obtriangular, reflexed forwards. . . . . *indicus* Silv.

Myrmedonota Cam.

1. Black or pitchy-black, shining; the first two visible segments of the abdomen testaceous-yellow; first two joints of the antennae and the legs testaceous, the apices of the femora and the tibiae more or less pitchy. Length 3 mm. . (135) *cingulata* Cam.

Myrmedonia Er.

1. 2nd joint of the antennae much shorter than the 3rd; 3rd and following joints compressed. Size larger; species reddish-brown . . . . *indorum* Fauv.
— 2nd joint of the antennae but little shorter than the 3rd; 3rd and following joints not compressed. Size smaller; species shining black, the base of the elytra and first four visible abdominal segments reddish-testaceous (136) *apicalis* Cam.

Schistogenia Kr.

1. Reddish-brown, opaque, coarsely and rugosely punctured . . . . *crenicollis* Kr.

Myrmedonella Cam.

1. Bright rufo-testaceous, shining; the elytra pitchy-red. Antennae, mouth-parts and legs reddish-testaceous. Length 1·8 mm. . . . . (137) *rufa* Cam.

Tetrasticta Kr.

1. Black, shining, base of the antennae and of the abdomen and legs testaceous; elytra brown . . . . . *polita* Kr.

Paraleochara Cam.

1. Shining castaneous, elytra pitchy-black; abdomen reddish-testaceous, the 6th and 7th segments black; first three joints of the antennae, mouth-parts and legs testaceous . . . . (138) *fungivora* Cam.

Hoplandria Kr.

1. Pitchy-brown, shining, narrowed behind; elytra darker, base of the abdomen lighter, first four and apex of the last joints of the antennae, mouth-parts and legs testaceous . . . . (139) *frugivora* Cam.

Aleochara Grav.

1. Mesosternum simple, the antennae stout, the penultimate joints three times as broad as long (Sub-gen. *Heterochara*

Rey). Black, shining, the elytra red, with a large lateral spot black; base of the antennae and legs testaceous. Length 3 mm. var. *maculipennis* Kr. (*croceipennis* Motsch.).

— Mesosternum keeled. 2.

2. Elytra sinuate internal to the postero-external angles. Species pitchy, the elytra red, with triangular scutellary marking and the sides dark; abdomen very thickly punctured in front. . *puberula* Klug.

— Elytra not sinuate. 3.

3. Penultimate joints of the antennae three times broader than long. Species black, the first three joints of the antennae pitchy-testaceous; legs reddish-testaceous . . . . *nigra* Kr.

— Penultimate joints of the antennae moderately transverse. 4.

4. Thorax with all the margins narrowly but distinctly testaceous; first two joints of the antennae clear testaceous . . *asiatica* Kr.

— Thorax at most with the lateral margins obscurely reddish-testaceous; first two joints of the antennae red . . *riatica* Faun.

LIST OF THE *STAPHYLINIDAE* OF SINGAPORE *

I. Subfam. **Oxytelinae.**

I. Tribe Piestini.

Sub-tribe *Eleusii.*

Genus **Eleusis** Cast.

fusciceps Kr. Arch. Naturgesch., xxv, 1859, i, p. 184.
humilis Er. Gen. Spec. Staph., p. 839.
kraatzi Fauv. Ann. Mus. Civ. Gen., xii, 1878, p. 207.
lunigera Fauv. Rev. d'Ent., xxiii, 1904, p. 84.

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* Species of which the type form is not recorded from Singapore are placed in brackets.

Sub-tribe *Leptochiri.*

Genus **Leptochirus** Germ.

Sub-gen. *Strongylochirus* Bernh.

laevis Cast. Hist. Nat., i, 1840, p. 186.

Genus **Borolinus** Bernh.

(*minutus* Cast. Hist. Nat., i, 1840, p. 186.)
var. *cruentus* Fauv. Rev. d'Ent., xiv, 1895, p. 181.

Genus **Priochirus** Sharp.

Sub-gen. *Triacanthus* Bernh.

(*tridens* Motsch. Bull. Mosc., xxx, 1857, ii, p. 502.)
var. *insularis* Bernh. D. E. Z., 1903, p. 139.

Sub-gen. *Cephalomerus* Bernh.

hoplites Fauv. Rev. d'Ent., xiv, 1895, p. 182.
pygmaeus Kr. Arch. Naturgesch., xxv, 1859, i, p. 191.

Sub-tribe *Lispini.*

Genus **Ancaeus** Fauv.

exiguus Er. Gen. Spec. Staph., p. 830.
singularis n. sp. Trans. Ent. Soc., 1918, p. 58.

Genus **Holosus** Motsch.

plicatus Bernh. W. Z. B., liv, 1904, p. 14.
tachyporiformis Motsch. Bull. Mosc., xxx, 1857, ii, p. 498.

Genus **Lispinus** Er.

coarcticollis Kr. Arch. Naturgesch., xxv, 1859, p. 186.
impressicollis Motsch. Bull. Mosc., xxx, 1857, ii, p. 495.
minutus n. sp. Trans. Ent. Soc., 1918, p. 60.
setosus, n. sp. Trans. Ent. Soc., 1918, p. 59.
sharpi, n. sp. Trans. Ent. Soc., 1920, p. 278.
tenuicornis Kr. Arch. Naturgesch., xxv, 1859, i, p. 187.

II. Tribe Omaliini.

Genus **Phloeonomus** Heer.

Sub-gen. *Phloeonomus* s.str. Ganglb.

discalis Cam. Trans. Ent. Soc., 1913, p. 525.
obscurus Kr. Arch. Naturgesch., xxv, 1859, i, p. 181.

III. Tribe Oxytelini.

Sub-tribe *Oxyteli.*

Genus **Trogophloeus** Mannh.

Sub-gen. *Trogophloeus* s.str.

orientalis, n. sp. Trans. Ent. Soc., 1918, p. 61.
silvestris, n. sp. Trans. Ent. Soc., 1918, p. 61.

Sub-gen. *Taenosoma* Mannh.

halophiloides, n. sp. Trans. Ent. Soc., 1918, p. 62.
littoralis, n. sp. Trans. Ent. Soc., 1918, p. 63.
lucens, n. sp. Trans. Ent. Soc., 1918, p. 63.
rufotestaceus, n. sp. Trans. Ent. Soc., 1918, p. 64.

Genus **Oxytelus** Grav.

Sub-gen. *Caccoporus* Thoms.

bengalensis Er. Gen. Spec. Staph., p. 789.
ferrugineus Kr. Arch. Naturgesch., xxv, 1859, p. 173.
nigriceps Kr. Arch. Naturgesch., xxv, 1859, i, p. 171.
exasperatus Kr. Arch. Naturgesch., xxv, 1859, i, p. 175.
frugicola, n. sp. Trans. Ent. Soc., 1918, p. 67.
granadillae, n. sp. Trans. Ent. Soc., 1918, p. 66.
kraatzi, n. n.
pulcher Kr. Arch. Naturgesch., xxv, 1859, i, p. 173.
latiusculus Kr. Arch. Naturgesch., xxv, 1859, i, p. 176.
nitidifrons Woll. Ann. Mag. Nat. Hist., (4) viii, 1871, p. 411.
obscurus, n. sp. Trans. Ent. Soc., 1918, p. 67.
pygmaeus Kr. Arch. Naturgesch., xxv, 1859, i, p. 176.
raffrayi Fauv. Rev. d'Ent., xxiv, 1905, p. 117.
thoracicus Motsch. Bull. Mosc., 1857, iv, p. 504.

Genus **Bledius** Mannerh.

bellicosus Fauv. Rev. d'Ent., xxiii, 1904, p. 111.

Sub-tribe *Thinobii.*

Genus **Thinobius** (s.str.) Muls. & Rey.

marinus Cam. E. M. M., 1917, p. 155.

IV. Tribe Osoriini.

Sub-tribe *Osorii.*

Genus **Paragonus** Fauv.

heteroceros Fauv. Rev. d'Ent., xxiv, 1905, p. 134.

Genus **Mimogonus** Fauv.

fumatior Fauv. Rev. d'Ent., viii, 1889, p. 246.

Genus **Holotrochus** Er.

nitidus, n. sp. Trans. Ent. Soc., 1918, p. 68.

Genus **Osorius** Latr.

rugifrons Er. Gen. Spec. Staph., p. 756.

II. Sub-fam. **Megalopsinae.**

I. Tribe Megalopsini.

Genus **Megalops** Er.

? sp. The specimen having escaped.

III. Sub-fam. **Steninae.**

I. Tribe Stenini.

Genus **Stenus** Latr.

Sub-gen. *Hypostenus* Rey.

(?) *bivulneratus* Motsch. Bull. Mosc., 1857, ii, p. 514.
castaneus, n. sp. Trans. Ent. Soc., 1918, p. 69.
fortepunctatus, n. sp. Trans. Ent. Soc., 1918, p. 68.
monomeros Fauv. Rev. d'Ent., xiv, 1895, p. 214.

IV. Sub-fam. **Evaesthetinae.**

I. Tribe Stenaesthetini.

Genus **Stenaesthetus** Sharp.

sunioides Sharp. Trans. Ent. Soc., 1874, p. 80.

II. Tribe Evaesthetini.

Genus **Edaphus** J. Lec.

dentiventris Fauv. Rev. d'Ent., xxiv, 1905, p. 137.

V. Sub-fam. **Paederinae.**

I. Tribe Pinophilini.

Sub-tribe *Pinophili.*

Genus **Pinophilus** Grav.

borneensis Fauv. Rev. d'Ent., xiv, 1895, p. 221.
orientalis Cam. Trans. Ent. Soc., 1920, p. 278.

Neopinophilus, n. gen. Trans. Ent. Soc., 1920, p. 279.
notabilis, n. sp. Trans. Ent. Soc., 1918, p. 70 (*Pinophilus*).

Sub-tribe *Procirri.*

Genus **Eucirrus.**

miricornis Fauv. Rev. d'Ent., xiv, 1895, p. 216.

Genus **Palaminus** Er.

bryanti, n. sp. Trans. Ent. Soc., 1920, p. 280.
parvus, n. sp. Trans. Ent. Soc., 1918, p. 71.

II. Tribe Paederini.

Genus **Paederus** F.

tamulus Er. Gen. Spec. Staph., p. 661.

Genus **Astenus** Steph.

castaneus, n. sp. Trans. Ent. Soc., 1920, p. 281.
gracilentus Fauv. Ann. Mus. Civ. Gen., xv, 1879–80, p. 83.
gracilis Kr. Arch. Naturgesch., xxv, 1859, i, p. 147.
orientalis, n. sp. Trans. Ent. Soc., 1918, p. 71.

Genus **Stilicopsis** Sachse.

breviceps Fauv. Rev. d'Ent., xxiv, 1905, p. 138.
obliqua, n. sp. Trans. Ent. Soc., 1918, p. 72.
persimilis, n. sp. Trans. Ent. Soc., 1918, p. 72.

Genus **Stilicus** Latr.

ocularis Fauv. Rev. d'Ent., xiv, 1895, p. 226.

Genus **Psilotrachelus** Kr.

crassus Kr. Arch. Naturgesch., xxv, 1859, i, p. 124.

Genus **Thinocharis** Kr.

carinicollis Kr. Arch. Naturgesch., xxv, 1859, i, p. 143.
nigricans, n. sp. Trans. Ent. Soc., 1918, p. 73.
pygmaea Kr. Arch. Naturgesch., xxv, 1859, i, p. 143.

Genus **Acanthoglossa** Kr.

hirta Kr. Arch. Naturgesch., xxv, 1859, i, p. 144.

Genus **Medon** Steph.

Sub-gen. *Medon* s.str.

opacellus Fauv. Rev. d'Ent., xiv, 1895, p. 231.
orientalis, n. sp. Trans. Ent. Soc., 1920, p. 281.
rubicundus, n. sp. Trans. Ent. Soc., 1918, p. 73.

Sub-gen. *Hypomedon* Cas.

debilicornis Woll. Cat. Col. Mad., 1857, p. 194.
fasciatus, n. sp. Trans. Ent. Soc., 1918, p. 74.
granulatus, n. sp. Trans. Ent. Soc., 1918, p. 75.
lucens, n. sp. Trans. Ent. Soc., 1918, p. 75.

Sub-gen. *Lithocharis* Boisd. & Lacord.

ochraceus Grav. Col. Micr. Brunsv., 1802, p. 59.
uvidus Kr. Arch. Naturgesch., xxv, 1859, i, p. 138.

Sub-gen. *Isocheilus* Sharp.

staphylinoides Kr. Arch. Naturgesch., xxv, 1859, i, p. 134.

Sub-gen. *Charichirus* Sharp.

chinensis Boh. Eugen. Resa, 1858, Ins. p. 32.
terminalis, n. sp. Trans. Ent. Soc., 1920, p. 282.

Parascopaeus, n. sub-gen.

nitidus, n. sp. Trans. Ent. Soc., 1918, p. 76.

Genus **Scopaeus** Er.

limbatus Kr. Arch. Naturgesch., xxv, 1859, i, p. 130.
micros Kr. Arch. Naturgesch., xxv, 1859, i, p. 132.
niger, n. sp. Trans. Ent. Soc., 1918, p. 77.
pallidulus, Kr. Arch. Naturgesch., xxv, 1859, i, p. 131.
puncticeps Kr. Arch. Naturgesch., xxv, 1859, i, p. 132.
testaceus Motsch. Bull. Mosc., 1858, ii, p. 642.

Genus **Calliderma** Motsch.

nitens, n. sp. Trans. Ent. Soc., 1918, p. 79.
rufum, n. sp. Trans. Ent. Soc., 1918, p. 78.
rugicolle, n. sp. Trans. Ent. Soc., 1918, p. 80.

Genus **Cryptobium** Mannerh.

filum Kr. Arch. Naturgesch., xxv, 1859, i, p. 119.
foveatum, n. sp. Trans. Ent. Soc., 1918, p. 81.

VI. Sub-fam. **Staphylininae.**

I. Tribe Xantholinini.

Genus **Oligolinus** Casey.

parvus, n. sp. Trans. Ent. Soc., 1918, p. 81.

Genus **Leptacinus** Er.

tricolor Kr. Arch. Naturgesch., xxv, 1859, i, p. 110.

Genus **Somoleptus** Sharp.

linearis, n. sp. Trans. Ent. Soc., 1918, p. 82.

Genus **Eulissus** Mannerh.

lateralis, n. sp. Trans. Ent. Soc., 1918, p. 83.

Genus **Thyreocephalus** Guer.

annulatus Fauv. Rev. d'Ent., xiv, 1895, p. 241.

Genus **Diochus** Er.

pulchellus, n. sp. Trans. Ent. Soc., 1918, p. 84.

II. Tribe Staphylinini.

I. Sub-tribe *Staphylini.*

Holisomimus, n. gen. Trans. Ent. Soc., 1920, p. 283.
cingulatus, n. sp. Trans. Ent. Soc., 1918, p. 85 (*Holisus*).
parvus, n. sp. Trans. Ent. Soc., 1918, p. 85 (*Holisus*).

Genus **Actobius** Fauv.

laticeps, n. sp. Trans. Ent. Soc., 1918, p. 86.

Genus **Philonthus** Curtis.

belonuchoides, n. sp. Trans. Ent. Soc., 1918, p. 88.
castaneipennis, n. sp. Trans. Ent. Soc., 1918, p. 87.
circumductus Fauv. Rev. d'Ent., xiv, 1895, p. 263.
crassicornis Fauv. Rev. d'Ent., xiv, 1895, p. 264.
delicatulus Boh. Eugen. Resa, 1858, Ins. p. 29.
flavocinctus Motsch. Bull. Mosc., xxxi, 1858, p. 663.
gemellus Kr. Arch. Naturgesch., xxv, 1859, i, p. 91.
geminus Kr. Arch. Naturgesch., xxv, 1859, i, p. 87.
longiceps Fauv. Ann. Mus. Civ. Gen., xv, p. 104.
maritimus Motsch. (*Gabrius*). Bull. Mosc., xxxi, 1858, ii, p. 661.
notabilis Kr. Arch. Naturgesch., xxv, 1859, i, p. 79.
pulchellus Kr. (*Gabrius*). Arch. Naturgesch., xxv, i, p. 92.
sulcatus, n. sp. Trans. Ent. Soc., 1918, p. 87.

Genus **Orthidus** Muls. & Rey.

cupreipennis, n. sp. Trans. Ent. Soc., 1918, p. 89.

Genus **Cafius** Steph.

corallicola Fairm. Rev. Zool., 1849, p. 289.
nauticus Fairm. Rev. Zool., 1849, p. 288.

Genus **Hesperus** Fauv.

laevigatus Fauv. Rev. d'Ent., xiv, 1895, p. 259.

Genus **Belonuchus** Nordm.

aeneipennis Fauv. Rev. d'Ent., xiv, 1895, p. 268.
mutator Fauv. Ann. Mus. Civ. Gen., xv, p. 106.

III. Tribe Quediini.

Genus **Acylophorus** Nordm.

rotundicollis, n. sp. Trans. Ent. Soc., 1918, p. 90.

VII. Sub-fam. **Pygosteninae.**

Genus **Delibius** *Fauv.*

longicornis Fauv. Rev. d'Ent., xviii, 1899, p. 13.

VIII. Sub-fam. **Tachyporinae.**

I. Tribe Megarthropsini.

Megarthropsis, n. gen.

decorata, n. sp. Trans. Ent. Soc., 1918, p. 232.

II. Tribe Tachyporini.

Genus **Atanygnathus** Jacobson.

terminalis Er. Kaf. Mark. Brand., p. 418.

Genus **Conosoma** Kr.

abdominale, n. sp. Trans. Ent. Soc., 1918, p. 235.
ceylanense Kr. Arch. Naturgesch., xxv, 1859, i, p. 62.
championi, n. sp. Trans. Ent. Soc., 1918, p. 236.
flavoguttatum, n. sp. Trans. Ent. Soc., 1918, p. 234.
malayanum, n. sp. Trans. Ent. Soc., 1920, p. 283.
nigromaculatum, n. sp. Trans. Ent. Soc., 1918, p. 237.
perplexum, n. sp. Trans. Ent. Soc., 1918, p. 237.
rufobrunneum, n. sp. Trans. Ent. Soc., 1918, p. 234.
rufotestaceum, n. sp. Trans. Ent. Soc., 1918, p. 238.
robustum, n. sp. Trans. Ent. Soc., 1918, 233.
suave Fauv. Rev. d'Ent., xiv, 1895, p. 284.
walkeri, n. sp. Trans. Ent. Soc., 1918, p. 236.

Genus **Tachinomorphus** Kr.

ceylonicus Bernh. D. E. Z., 1902, p. 24.
fulvipes Er. Gen. Spec. Staph., p. 921.

Genus **Coproporus** Kr.

atomus Kr. Arch. Naturgesch., xxv, 1859, i, p. 58.
brunneicollis Motsch. Bull. Mosc., xxxi, 1858, iii, p. 220.
fasciipennis Kr. Arch. Naturgesch., xxv, 1859, i, p. 59.
flavipennis, n. sp. Trans. Ent. Soc., 1918, p. 239.
melanarius Er. Gen. Spec. Staph., p. 252.
minimus Motsch. Bull. Mosc., xxxi, 1858, ii, p. 220.
parvulus, n. sp. Trans. Ent. Soc., 1918, p. 240.
rufiventris, n. sp. Trans. Ent. Soc., 1918, p. 238.
secretus Bernh. Col. Rundsch., 1917 (7/9), p. 4.
varians, n. sp. Trans. Ent. Soc., 1920, p. 284.

Genus **Leucoparyphus** Kr.

silphoides L. Syst. Nat., i, 2, 1735, p. 684.

Mimocyptus, n. gen.

globulus, n. sp. Trans. Ent. Soc., 1918, p. 241.

IX. Sub-fam. **Adimopsinae.**

Adimopsis, n. gen.

rufobrunnea, n. sp. Trans. Ent. Soc., 1918, p. 243.

X. Sub-fam. **Aleocharinae.**

I. Tribe Gymnusini.

Genus **Leucocraspedum** Kr.

nigrum, n. sp. Trans. Ent. Soc., 1918, p. 243.

II. Tribe Myllaenini.

Genus **Myllaena** Er.

faberensis, n. sp. Trans. Ent. Soc., 1918, p. 244.

III. Tribe Pronomaeini.

Genus **Pronomaea** Er.

leontopolitana, n. sp. Trans. Ent. Soc., 1918, p. 245.

IV. Tribe Diglottini.

Genus **Diglotta** Champ.

testaceipennis, n. sp. Trans. Ent. Soc., 1918, p. 245.

V. Tribe Oligotini.

Genus **Oligota** Mannerh.

forticornis, n. sp. Trans. Ent. Soc., 1920, p. 212.
moultoni, n. sp. Trans. Ent. Soc., 1920, p. 212.

VI. Tribe Bolitocharini.

Pseudoligota, n. gen.

robusta, n. sp. Trans. Ent. Soc., 1920, p. 215.
varians, n. sp. Trans. Ent. Soc., 1920, p. 214.

Genus **Gyrophaena** Mannerh.

appendiculata Motsch. Bull. Mosc., 1858, iii, p. 228.
laminata Kr. Arch. Naturgesch., xxv, 1859, i, p. 45.

Sub-gen. *Gyrophaena* s.str.

bidens, n. sp. Trans. Ent. Soc., 1920, p. 217.
crenulata, n. sp. Trans. Ent. Soc., 1920, p. 216.
cristata, n. sp. Trans. Ent. Soc. 1920, p. 217.
dubia, n. sp. Trans. Ent. Soc., 1920, p. 218.
granulosa, n. sp. Trans. Ent. Soc., 1920, p. 216.
irregularis, n. sp. Trans. Ent. Soc., 1920, p. 218.
moultoni, n. sp. Trans. Ent. Soc., 1920, p. 219.
tridentata, n. sp. Trans. Ent. Soc., 1920, p. 215.

Sub-gen. *Phaenogyra* Rey.

metallica, n. sp. Trans. Ent. Soc., 1920, p. 220.

Sternotropa, n. gen.

nigra, n. sp. Trans. Ent. Soc., 1920, p. 221.
ruficollis, n. sp. Trans. Ent. Soc., 1920, p. 221.

Adelarthra, n. gen.

barbara, n. sp. Trans. Ent. Soc., 1920, p. 223.

Hetairotermes.*

* Nom. nov. for *Termophila* Lea, nom. praeoc.

agilis, n. sp. Trans. Ent. Soc., 1920, p. 223.
piceus, n. sp. Trans. Ent. Soc., 1920, p. 224.

Pseudatheta, n. gen.

elegans, n. sp. Trans. Ent. Soc., 1920, p. 225.

Pelekoglossa, n. gen.

cingulata, n. sp. Trans. Ent. Soc., 1920, p. 227.

Genus **Placusa**, Er.

bispina, n. sp. Trans. Ent. Soc., 1920, p. 228.
conura, n. sp. Trans. Ent. Soc., 1920, p. 227.
lobata, n. sp. Trans. Ent. Soc., 1920, p. 228.
notabilis, n. sp. Trans. Ent. Soc., 1920, p. 229.

Pseudoplacusa, n. gen.

rufiventris, n. sp. Trans. Ent. Soc., 1920, p. 230.

Chledophila, n. gen.

annularis, n. sp. Trans. Ent. Soc., 1920, p. 232.

Neosilusa, n. gen.

ceylonica Kr. Arch. Naturgesch., xxv, 1859, i, p. 10 (*Stenusa*).
moultoni, n. sp. Trans. Ent. Soc., 1920, p. 233.

Ousilusa, n. gen.

castanea, n. sp. Trans. Ent. Soc., 1920, p. 235.
myrmecobia, n. sp. Trans. Ent. Soc., 1920, p. 235.

Prosilusa, n. gen.

rufa, n. sp. Trans. Ent. Soc., 1920, p. 237.

Deralia, n. gen.

fuscipennis, n. sp. Trans. Ent. Soc., 1920, p. 238.

Pseudophaena, n. gen.

castanea, n. sp. Trans. Ent. Soc., 1920, p. 240.

Genus **Coenonica** Kr.

angusticollis, n. sp. Trans. Ent. Soc., 1920, p. 240.
puncticollis Kr. Linn. Ent., xi, p. 47.
stricticollis, n. sp. Trans. Ent. Soc., 1920, p. 241.

Mimomalota, n. gen.

bispina, n. sp. Trans. Ent. Soc., 1920, p. 243.
testacea, n. sp. Trans. Ent. Soc., 1920, p. 243.

Neomalota, n. gen.

cingulata, n. sp. Trans. Ent. Soc., 1920, p. 245.

Lampromalota, n. gen.

brunneicollis, n. sp. Trans. Ent. Soc., 1920, p. 246.

Genus **Homalota** Mannerh.

bidens, n. sp. Trans. Ent. Soc., 1920, p. 247.
cingulata, n. sp. Trans. Ent. Soc., 1920, p. 248.
denticulata, n. sp. Trans. Ent. Soc., 1920, p. 250.
fuscipennis, n. sp. Trans. Ent. Soc., 1920, p. 248.
nitescens, n. sp. Trans. Ent. Soc., 1920, p. 247.
platygaster, Kr. Arch. Naturgesch., xxv, 1859, i, p. 33.
serrata, n. sp. Trans. Ent. Soc., 1920, p. 249.
tuberculicollis Kr. Arch. Naturgesch., xxv, 1859, p. 33.
variventris Kr. Arch. Naturgesch., xxv, 1859, p. 34.

Genus **Thectura** Thoms.

brunneicollis, n. sp. Trans. Ent. Soc., 1920, p. 250.

Genus **Heterota** Rey.

arenaria, n. sp. Trans. Ent. Soc., 1920, p. 251.

Paractocharis, n. gen.

fucicola, n. sp. Ent. Mo. Mag., 1917, p. 154.

VII. Tribe Myrmedoniini.

Genus **Falagria** Mannerh.

Sub-gen. *Falagria* s.str.

brevicornis, n. sp. Trans. Ent. Soc., 1920, p. 252.
dimidiata Motsch. Bull. Mosc., 1858, ii, p. 260.
flavipennis, n. sp. Trans. Ent. Soc., 1920, p. 253.
pygmaea Kr. Arch. Naturgesch., xxv, 1859, i, p. 7.
tenuicornis, n. sp. Trans. Ent. Soc., 1920, p. 252.

Sub-gen. *Cardiola* Rey.

vestita Boh. Eugen. Resa, 1858, Ins., p. 25.

Genus **Amaurodera** Fauv.

veluticollis Motsch. Bull. Mosc., 1858, ii, p. 261.

Eusteniamorpha, n. gen.

rufa, n. sp. Trans. Ent. Soc., 1920, p. 254.

Genus **Pelioptera** Kr.

micans Kr. Linnaea Ent., xi, p. 55.
opaca Kr. Linnaea Ent., xi, p. 56.

Genus **Atheta** Thoms.

Sub-gen. *Glossola* Fowler.

moultoni, n. sp. Trans. Ent. Soc., 1920, p. 255.

Sub-gen. *Metaxya* Rey.

alophila, n. sp. Trans. Ent. Soc., 1920, p. 256.

Genus (?) **Dralica** Rey.

picea, n. sp. Trans. Ent. Soc., 1920, p. 256.

Sub-gen. *Microdota* Rey.

inutilis Kr. Arch. Naturgesch., xxv, 1859, i, p. 35.
malayana, n. sp. Trans. Ent. Soc., 1920, p. 257.
melata, n. sp. Trans. Ent. Soc., 1920, p. 257.
purpurascens, n. sp. Trans. Ent. Soc., 1920, p. 259.
putridula Kr. Arch. Naturgesch., xxv, 1859, i, p. 35.
vulgaris, n. sp. Trans. Ent. Soc., 1920, p. 258.

Sub-gen. *Atheta* s.str.

dilutipennis Motsch. Bull. Mosc., 1858, ii, p. 252.
miriventris, n. sp. Trans. Ent. Soc., 1920, p. 259.

Sub-gen. *Dimetrota* Rey.

carpophila, n. sp. Trans. Ent. Soc., 1920, p. 260.
mycetophaga, n. sp. Trans. Ent. Soc., 1920, p. 262.
xylophila, n. sp. Trans. Ent. Soc., 1920, p. 261.

Sub-gen. *Datomicra* Rey.

mycetophila, n. sp. Trans. Ent. Soc., 1920, p. 263.
onthophila, n. sp. Trans. Ent. Soc., 1920, p. 262.

Sub-gen. *Colpodota* Rey.

ruparia, n. sp. Trans. Ent. Soc., 1920, p. 264.

Sub-gen. *Acrotona* Rey.

annuliventris Kr. Arch. Naturgesch., xxv, 1859, i, p. 40.
rufiventris, n. sp. Trans. Ent. Soc., 1920, p. 264.

Exatheta, n. gen.

cingulata, n. sp. Trans. Ent. Soc., 1920, p. 266.
consors, n. sp. Trans. Ent. Soc., 1920, p. 266.

Mimatheta, n. gen.

fungicola, n. sp. Trans. Ent. Soc., 1920, p. 267.

Mimacrotona, n. gen.

cingulata, n. sp. Trans. Ent. Soc., 1920, p. 269.

Paratheta, n. gen.

carnivora, n. sp. Trans. Ent. Soc., 1920, p. 270.

Fenyesia, n. gen.

nigra, n. sp. Trans. Ent. Soc., 1920, p. 271.

Genus **Termitoptochus,** Silv.

indicus Silv. Bol. Lab. Port., 5, 1909, p. 39.

Myrmedonota, n. gen.

cingulata, n. sp. Trans. Ent. Soc., 1920, p. 272.

Genus **Myrmedonia** Er.

apicalis, n. sp. Trans. Ent. Soc., 1920, p. 273.
indorum Fauv. Rev. d'Ent., xxii, p. 162.

Genus **Schistogenia** Kr.

crenicollis Kr. Linnaea Ent., xi, p. 39.

Aleocharini.

Myrmedonella, n. gen.

rufa, n. sp. Trans. Ent. Soc., 1920, p. 275.

Genus **Tetrasticta** Kr.

polita Kr. Linn. Ent., 1857, p. 55.

Paraleochara, n. gen.

fungivora, n. sp. Trans. Ent. Soc., 1920, p. 276.

Genus **Hoplandria** Kr.

frugivora, n. sp. Trans. Ent. Soc., 1920, p. 277.

Genus **Aleochara** Grav.

Sub-gen. *Xenochara* Rey.

puberula Klug. Ins. Madag., p. 139.

Sub-gen. *Heterochara* Rey.

(*croceipennis* Motsch. Bull. Mosc., 1858, ii, p. 238.)
v. *maculipennis* Kr. Arch. Naturgesch., xxv, 1859, i, p. 17.

Sub-gen. *Polychara* Rey.

asiatica Kr. Arch. Naturgesch., xxv, 1859, i, p. 15.
nigra Kr. Arch. Naturgesch., xxv, 1859, i, p. 13.
viatica Fauv. Rev. d'Ent., xxiii, p. 67.

Corrigenda.

1918, p. 65. Delete description of *Aploderus testaceus*, n. sp., which is *Oxytelus thoracicus* Motsch., Bull. Mosc., 1857, iv, p. 504.

1918, p. 68, line 28, for *Tesnus* read *Hypostenus*.

1920, p. 215, line 5, for *robustus* read *robusta*.

XVII. *Description of the female of* Chiastopsylla godfreyi *Waterst., with further notes on the Genus.* By James Waterston, B.D., B.Sc.

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[Read December 1st, 1920.]

Since my original notice of the male of this species appeared (Proc. Roy. Phys. Soc. Edin., Vol. XIX, No. 1, pp. 8–11, fig. 1, 15 : iii : 1913) no further records of its occurrence appear to have been made, and the female is still undescribed. Among some parasites of small mammals from Grahamstown submitted to me in the beginning of 1915 and subsequently put aside, there are two females of this genus which, from their association with the known male of *C. godfreyi* and from their general characters, are probably referable to this species. As Mr. Rothschild, to whom I am indebted for examining some preparations, agrees in this opinion I have drawn up the following notes.

Chiastopsylla godfreyi Waterst.

♀. Head evenly rounded. Frontal notch obsolete, one moderate bristle at the edge of the eye anteriorly, two long and stout above the genal edge with a third finer and shorter above the more anterior of the two. Five to six short fine hairs along the upper edge of the antennal groove with three stouter bristles in a line above. Transverse row of seven to eight fine bristles before the posterior edge. Max. palpus 6, 6, 5, 7. Thorax similar to *C. rossi* Waterst. Mesonotum, median row of bristles 9–10. Metanotum, antemedian row of seven to eight bristles. Epimeron with five bristles (2, 3). The posterior edges of the metanotum and of the abdominal tergites are thin and nowhere develop the darkened triangular chitinous teeth found in *C. rossi* Waterst., and *C. numae* Rothsch.

The chaetotaxy of the abdominal sclerites is as follows :—

Tergites	I.	II.	III.	IV.	V.	VI.	VII.
Ante median	6	4	6	4	3	3	4
Post median	8	13	14	13	12	12	10
Sternites	–	2	8	8	7	6	10

The antepygidial bristle is as long as the second joint of the hind tarsus. Stylet slender (4 : 1), but much shorter (2 : 5) than the elongate apical bristle. Modified segments (see fig. 1). Receptaculum seminis (fig. 1*a*) with the head shorter than the distinctly slender tail.

Legs :—On the dorsal edge of the hind tibia between the 4th and 5th pairs of spines is a wide spineless gap. The proportions of the tarsal joints are much as in *C. rossi* Waterst., but in the mid leg (where the first three segments are in the ratio 25, 27½, 20) the second and third are longer, while in the hind leg (where the first two

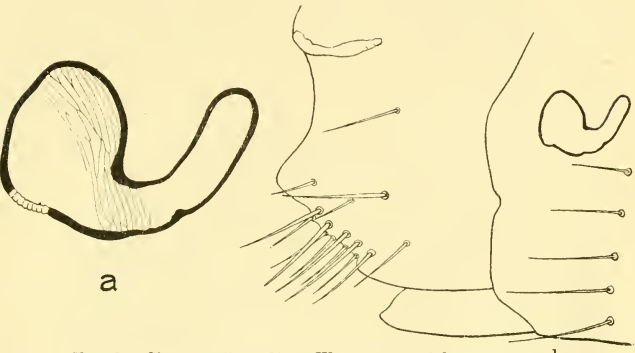

Fig. 1.—*Chiastopsylla godfreyi* Waterst, ♀. 8th segment and 7th sternite. *a*, receptaculum seminis.

segments are in ratio 50, 33) the second segment is a trifle shorter than in *C. rossi*.

Length, a little over 2 mm.

KEY TO THE SPECIES OF *CHIASTOPSYLLA* ROTHSCH.

1.	Males.	2.
—	Females.	4.
2.	Frons evenly rounded. "Finger," broadest below the middle, short, not exceeding in length the greatest breadth of the 9th sternite whose fringing bristles are all simple . . .	*godfreyi* Waterst.
—	Frons with distinct angle near the base of the maxillary palpus. "Finger"	

	slender, broadest near base, greatly exceeding the breadth of the 9th sternite, which bears three pairs of scales distally.	3.
3.	Eighth sternite finger like distally, the three scales on the 9th diamond-shaped equal, acutely pointed . .	*numae* Rothsch.
—	Eighth sternite wedge-shaped, the scales dissimilar. The uppermost broad, subquadrate, the second deeply and roundly emarginate distally, the third longest pointed spatulate . . .	*rossi* Waterst.
4.	Posterior edge of 7th sternite incised about the middle.	5.
—	Posterior edge of 7th sternite entire or produced medianly.	6.
5.	Eighth tergite with about a dozen stiff bristles on its ventral half, not counting those which stand along the margin posteriorly. Incision of the 7th tergite moderately deep. Metanotum and some of the tergites armed with teeth on hind margin . . .	*numae* Rothsch.
—	Eighth tergite nearly bare ventrally, incision shallow, marginal teeth absent	*godfreyi* Waterst.
6.	Seventh sternite with edge posteriorly entire, four to five external bristles on hind tibia	*octavii* Rothsch.
—	Seventh sternite with short but distinct rounded median lobe, eight external bristles on hind tibia . . .	*rossi* Waterst.

In the above key by " tergite " and " sternite " reference is made strictly speaking only to *half* of the sclerites respectively indicated, *i. e.* to the profile view afforded in a whole mount. *Chiastopsylla* Rothsch., so far as our knowledge goes at present, is an exclusively S. African (Cape Colony) genus associated with small ground mammals of the genera *Mus*, *Mystromys*, *Otomys*, *Crocidura*, *Graphocularis* and *Arvicanthis*.

XVIII. *On a new African Fig Insect* (Blastophaga dyscritus, *sp. n.*). By James Waterston, B.D., B.Sc.

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[Read December 1st, 1920.]

In some recent notes on Fig Insects (Trans. Ent. Soc. Lond., 1920, p. 128) I recorded under the name *Blastophaga allotriozoonoides* Grnd., a single ♀ from Kabete, B.E. Africa (T. J. Anderson), which, as I remarked at the time, did not quite agree with the description and figures of that species. When the notes referred to were being drawn up it did not seem to me safe to send the slide by post to Portici, but this difficulty has now been removed, and Dr. Grandi after comparing my specimen with *B. allotriozoonoides* Grnd., and the closely related *B. enriquesi* Grnd., is definitely of the opinion that the Entebbe example is referable to neither species and should be considered new. Dr. Grandi's two species and that now described form a group whose members are exceedingly closely related, but a detailed comparison of the three shows minute differences all over. While it is possible that additional annectant forms may be discovered (which might give rise to a discussion of the status of members of the group), it seems best to treat the three known forms separately, as they are probably attached to different plants. Unfortunately in none of the three cases is the host fig known.

Blastophaga dyscritus, sp. n.

Head :—Length (depth) and breadth subequal (39 : 40). Lobes of the clypeus distinct. Antenna (fig. 1 *a*). Scape (2 : 1) with a well-marked ventral prominence. Pedicel (9 : 7) flatter along the dorsal edge and more salient medianly ventrally. The seven sensoria-bearing joints of the funicle (reckoning from the base of each to the apex of the lowermost sense organ) are in the following ratio, 31, 34, 32, 32, 35, 35, 34, with breadths respectively 26, 26, 29, 31, 33, 30, 20. These breadths have been measured under slight pressure. Sensoria on joints, five to eleven, as follows :—10, 10, 11, 12–13, 12, 11, 7–8. Mandible (fig. 1 *b*) massive, its ventral outline less quadrate than in

either *B. allotriozoonoïdes* or *B. enriquesi*, with six laminar ridges whose inner terminations from the 2nd to the 4th project like teeth. There are besides three apical teeth. Appendage narrow with about twenty rows of denticulations. The last (innermost) denticle in each row larger and stout. Excluding this the maximum number of denticles in a row is six to seven. The outer edge of the appendage

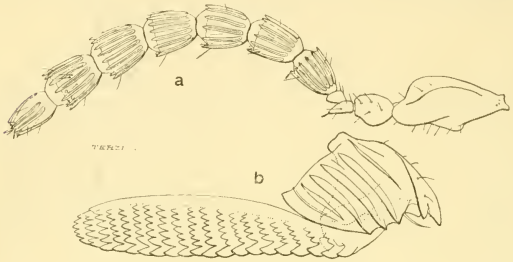


Fig. 1.

thins out into an exceedingly fine smooth edge. Not reckoning this fine edge the appendage is about six times as long as broad.

Legs :—Fore-legs, coxae twice as long as broad. Femur nearly three times as long as broad. Mid-legs, coxa broader than long (5 : 4). Femur nearly thrice the trochanter in length. Tarsus first joint longer (5 : 4) than the second, fifth longer (9 : 7) than the third. Femur about one and three-quarter times as long as broad.

Dimensions :—Length, head and body = about 2 mm., ovipositor 1·2 mm. Length of fore-wing, 1·5 mm., breadth, ·7 mm.

Type ♀ in B.M.

April 21, 1921.

THE

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1920.

Wednesday, February 4th, 1920.

Comm. J. J. WALKER, M.A., R.N., F.L.S., President, in the Chair.

Election of Fellows.

Miss WINIFRED E. BRENCHLEY, D.Sc., F.L.S., Rothamsted Experimental Station, Harpenden, Herts; Messrs. ALFRED ELLIS BURRAS, 3, Connaught Road, North End, Portsmouth; ALBERT ERNEST HODGE, 14, Astonville Street, Southfields, S.W. 18; Rev. MELVILLE JONES, 16, New Bridge Street, E.C. 4, and Hope Fountain, Box 283, Bulwayo, Rhodesia; Messrs. GEORGE BEDDOME CURTIS LEMAN, GEORGE CURTIS LEMAN, SYDNEY CURTIS LEMAN, Wynyard, 152, West Hill, Putney Heath, S.W. 15; and FRANK REGINALD MASON, Oxford, Harpenden, Herts, were elected Fellows of the Society.

Nomination of Vice-Presidents.

The PRESIDENT announced that he had nominated Dr. A. D. IMMS, the Rt. Honble. Lord ROTHSCHILD and Mr. W. G. SHELDON as Vice-Presidents for the ensuing session.

Exhibitions.

The protective movements of the conspicuous larva of the Catocaline moth, Cocytodes coerulea, Guér.—Prof. Poulton exhibited the coloured figure referred to in the following record by Mr. H. W. Simmonds of Waidoi, between Suva and Navua, Viti Levu, Fiji; also the moth bred from one of the larvae by the same naturalist.

Oct. 18, 1919.—"I enclose a drawing of the larva of a moth, one of three I found on a bush. When the bush was approached it lashed its anterior segments violently from side to side in a most alarming manner, shaking the whole branch violently. I had a couple of weeks earlier noticed these three larvae, then small, feeding in company with about 40 or 50 others of a different species. Some three hours later the whole of these latter had disappeared and only the three remained. A company of wax-eyes in the adjoining forest suggested the cause. I am pretty confident that if the three larvae had been as big as they were on my next visit no bird would have dared to approach it, and both species would have escaped."

Moths flying, but not at rest, captured by Bats.—Prof. Poulton drew attention to an observation by Mr. W. Feather at Kibwezi, B.E. Africa:—

Feb. 1, 1920.—"I was much interested in watching the bats flying in the room and taking moths, mainly *Cyligramma latona*, Cram., and *limacina*, Guér. As long as the moths were on the wing the bats caught them, but immediately they came to rest on the walls or ceiling they were quite safe, the bats, although flying past them quite close, never attempting to take them. It seems as if the bats can only recognise moths when on the wing."

Musca autumnalis, De G. (corvina, F.), hybernating in a loft at St. Helens, Isle of Wight, as in 1914–15 and 1917–18.—Prof. Poulton said that he had visited the loft on Dec. 16, 1919, and found one long narrow patch of many hundred flies and another small one of several dozen. A few were swept by hand from the former patch into a small box, and, when examined, were found to consist of 11 ♂ and

24 ♀ of *M. autumnalis*. Spider's web was far more evident than in previous years and perhaps pointed to the reason for the lessened number of the flies. The position of the groups was as described in Proc. Ent. Soc., 1915, p. xxi, and 1918, p. xxii, where it was also recorded that the females were far more numerous than the males.

Ophion undulatus, Grav., bred from Bombyx quercus, L., cocoons, from N. Staffordshire.—Prof. Poulton exhibited six examples of this fine Ichneumonid, said by Mr. Claude Morley to be common neither here nor on the continent ("Brit. Ichneumons," vol. v, *Ophioninae*, p. 279). The specimens were bred by Mr. F. C. Woodforde and appeared in following order:—1918, June 11—1 ♂, June 21—3 ♀; 1919, June 12—1 ♂, 1♀. The first was from *B. quercus*, the others from the var. *callunae*, Palmer. The cocoons were from wild larvae, those of the first four from the Burnt Woods, Market Drayton, of the last two from Ashley Heath in the same district.

Observations on the red (gregoryi, Dist.) and green (speciosa, Melich.) forms of the Homopteron Ityraea nigrocincta, Walk., at Kibwezi, B.E. Africa.—Prof. Poulton said that, after receiving the specimens exhibited at a previous meeting (Proc. Ent. Soc., 1918, p. lxxviii), he had written to Mr. W. Feather at Kibwezi, suggesting that it would be interesting to watch a particular set of nymphs, so as to determine whether the imagines emerged in batches of each colour. Although this point was not definitely settled, the following observations recorded by Mr. Feather, who had recently returned to this country, were of much interest. In bringing them forward a fine series of specimens collected Dec. 1-14, 1918, by the same naturalist, was also exhibited to the meeting:—

Plant No. 1.

1918.

"*June* 4.—Four branches 9 ft. from ground, ends covered with nymphs.

,, 5.—No change.

,, 10.—Very few nymphs. No imagines.

Plant No. 2 (5 *ft. high*).

1918.

"*June* 4.—About 10 imagines—all red.
,, 5.—About 15 imagines—all red.
,, 10.—All imagines gone.

Plant No. 3 (6 *ft. high*).

"*June* 4.—At the top 4 red imagines, then 1 green; below this again about 20 green followed by about 50 nymphs.
,, 5.—At the top 5 red with 2 nymphs in the midst of them, below 2 green followed by nymphs.
,, 10.—Red imagines and nymphs intermixed, with 1 green imago in the middle of them.

"On June 11 I had to go away and did not return for 10 days, when I found they had all disappeared."

In a letter of Feb. 1, 1920, Mr. Feather included further observations on the insect:—

"The nymphs occur in fairly large numbers on one bush, say from 50 to 250, and in a couple of hundred yards I have counted 32 bushes bearing them. They are often found in clusters on the underside of the leaves. This also applies to the imagines. I have seen some hundreds of branches with imagines on them, but have not been fortunate enough to see one with all green at the top. I have seen them with, say, one green at top, then a few red, then green again, red, and so on, in many varying ways."

Mr. A. Loveridge's observations at Morogoro (Mrogoro) in ex-G.E.Africa agreed precisely with those of Mr. Feather.

The arrangement observed in Mr. Feather's Nos. 2 and 3 supported the conclusion that the forms emerge in batches or waves, and it followed that sometimes the order would be that which produces likeness to a flowering spike with green buds at the top. Considering its evident rarity and in view of Mr. Feather's observations, Prof. Poulton now believed that this flower-like arrangement was an accidental result which was bound to happen from time to time. This conclusion was also supported by the fact that the species

appeared to be markedly gregarious and therefore unlikely to adopt a highly specialised form of Protective Resemblance.

Exotic Rhopalocera.—Mr. G. Talbot exhibited the following species on behalf of Mr. J. J. Joicey :—

Dasyopthalma rusina, Godt. A melanic aberration of the female in which the bands are only present as vestiges.

Papilio ridleyanus, White. Dark aberrations of the male in which the red spots of the fore-wing are obscured by dark scaling. In one specimen most of the scales on these spots are black with some red ones intermixed. In this specimen the hind-wing is also very dark. These aberrations seem to correspond to the female forms of *Acraea egina* and *zetes*, and of *Pseudacraea trimeni*, with which the Papilio is associated. This dark aberration has received the name of *fumata*, Niep.

Papilio phidias, Ob. A ♂ example of this very rare and extraordinary species from Tonkin. This species forms a link with the tailed *antiphates* and *aristeus* forms and the tailless *macareus* forms. It enters into the mimetic group with Danaine pattern. There are 3 ♂♂ in the Coll. of Oberthür, 2 ♂♂ in the Paris Museum, and 2 ♂♂ in the Joicey Coll. The latter are from Tonkin, and the others from Annam. The ♀ is unknown.

Heliconius from Matto Grosso :—

1. A distinct form of *elevatus*, Nold., probably undescribed and connecting this form with *bari*, Ob. The pattern of both wings is very similar to *bari*, but there are no apical spots on the fore-wing. In this it differs from *tamatumari*, Kaye. The two forms of *bari* occur in the Guianas, whilst *elevatus* occurs in Bolivia, Upper Amazon and Peru.

2. A species of *melpomene thelxiope* from Para, showing its great likeness to the *elevatus* form.

3. Form of *melpomene penelope*, Stgr. There are five forms.

(*a*) Fore-wing with much-reduced yellow band and no spot in the cell. Very similar to a specimen of *thelxiope* from the Lower Amazons.

(*b*) Fore-wing with yellow patch. The typical form, occuring also in Bolivia.

(*c*) Fore-wing with typical yellow patch, also a specimen with band as in (*a*). In the distal area next to the yellow band is a narrow red band as seen in some *melpomene* from Guiana.

(*d*) Fore-wing with a red patch and yellow costal spot. Hind-wing with a yellow transverse band. This is a very good mimic of the *erato* form *anacreon*, Gr.-Sm., from Bolivia. It is similar to *penelamanda*, Stgr.

(*e*) Fore-wing similar to (*c*), but the red band more pronounced and discal patch broken up into small spots. Hind-wing with a yellow band which is distally powdered with red.

4. Forms of *melpomene amandus*, Gr.-Sm. One specimen approaches *nanna*, Stich., from S. Brazil, in the yellow median stripe on fore-wing and the longer yellow band on hind-wing.

5. *H. erato phyllis*, Fbr. This form chiefly resembles the *amandus* form above.

6. A form of *erato phyllis* which resembles the *hydara* race. This is probably new.

7. A form of *erato* similar to the *erythraea* form from Guiana. The hind-wing bears a yellow discal spot, and there is some yellow scaling on the inside edge of the red band in the fore-wing.

8. A form of *erato* near *ottonis*, Riff.

9. A form of *erato* near *tellus*, Ob., with a yellow discal spot on the hind-wing.

10. A series of *erato tellus*, Ob., showing variation in the yellow patch of fore-wing similar to what is seen in specimens of this form from French Guiana. A similar variation occurs in the red form *erythraea*, Cram. The general tendency, however, in Matto Grosso *Heliconius* is for the fore-wing patch to have the spots united, whilst in those from French Guiana we find the breaking up of this patch a common variation. In other species from Matto Grosso which have a yellow fore-wing patch, the tendency to contracted spots is still the same.

11. *H. xanthocles melete*, Feld. A form with the yellow

patch showing a larger black spot than in typical specimens from Upper Amazons and Peru.

12. A form of *aeode* showing condensed yellow patch in fore-wing, and thereby exhibiting a transition to *astydamia*, Erichs.

13. *Eueides*, sp. nov., allied to *eueidina*, Ob., also shown. It is remarkable that another species of this curious group of *Eueides* should turn up in Matto Grosso. In comparison with the French Guiana species, this one has the yellow spots of the fore-wing closer together, and the hind-wing has typical *erato* flame streaks. It bears a close resemblance to some specimens of *erato tellus*.

The ♀ is not unlike the ♀ of the Guiana species. The difference between the sexes, which is unusual in *Heliconius*, indicates some biological necessity, and probably shows that the species belongs to a group apart from *Heliconius*.

Mr. Kaye assigned *eueidina* to *Eueides*, Oberthür having placed it in *Heliconius*.

It is evident that the Matto Grosso district around Cuyaba would yield some very interesting results in *Heliconius* if a large collection were made.

The fore-wing patch of both *melpomene* and *erato* begins to break up into spots in the various areas of distribution of these species proceeding from the Andes to the lower levels of the Amazon basin and the coast. It must be noted, however, that in French Guiana, as in British Guiana, typical *melpomene* far exceeds in numbers the various aberrations which are known to occur with it. The large number of forms of *melpomene* and *erato* received from French Guiana, and partly dealt with by Mr. Kaye in the transactions of this Society, was the result of special collecting initiated by a well-known Paris dealer in a manner calculated to make the most of its commercial possibilities.

European Orthoptera.—Lieut. E. B. Ashby exhibited the following species:—

Forficula auricularia, L., Arquata Scrivia. *Acrida nasuta*, L.; 11 males and 5 females; River Stura, Turin. *Stauroderus bicolor*, Char.; Vicenza, Turin, and Arquata Scrivia. *Chorthippus* (*Stenobothrus*) *dorsatus* Zett.; River Stura, Turin.

Epacromia thalassina, Fabr.; River Stura and River Sangone, Turin. *Pachytylus danicus*, L. (*cinerascens*, Fabr.); River Stura, Turin, and River Scrivia, Arquata Scrivia. *Oedipoda miniata*, Pall.; Arquata Scrivia, and Aigle, Rhone Valley. *Oe. caerulescens*, L.; Sassi; River Sangone; River Stura (all environs of Turin), and Arquata Scrivia.

Larva and Pupa of a Morpho.—Mr. Hy. J. Turner exhibited a tinted photograph of the larval habit of assembly, when not feeding, of *Morpho luertes* (?) sent to him by Mr. F. Lindeman of São Paulo, Brazil, and also a coloured photograph of the pupa *in situ* showing its close protective resemblance, and read the following note from his correspondent.

"*Nov.* 18, 1919.

"I have a good number of caterpillars feeding; the most interesting are a bunch of the larvae of some *Morpho*—probably a local form of *M. luertes*—I think, about the most beautiful caterpillars I have seen. I found them in two colonies, one of about ten and the other about thirty, all sitting together. At first I thought it was a beautiful orchid flower (and this is undoubtedly the impression they try to give). They had already changed their skin for the last time, and were about $\frac{3}{8}$ of an inch thick and about three inches long. The predominant colour is bright red—like red velvet—but on closer examination they have also deep yellow, blue and white. I have tried to make a painting of one; but I think it defies my skill, so I am resorting to the camera. They spin all over a leaf, and sit on it altogether—they make quite sure that the leaf can't fall off by spinning it securely on to the branch. At night they eat, and the next day you find them in exactly the same place again; in fact, if you hadn't seen them feeding at night (and to do this they, of course, separate) you would think they hadn't moved. When changing their food I always leave their spun-over leaf (their house)—and I have had them three weeks and they still inhabit the same house. The leaf drying up doesn't worry them; in fact, I found them on a dried-up leaf. A gentleman here, who has collected many years, told me it was useless trying to feed *Morpho* caterpillars in captivity as they always sat in a corner in the cage or ran

about away from the food; but this only happens when you take their house away from them when changing their food."

"*Dec.* 21, 1919.

"Only one of my *Morpho* caterpillars died, all the rest have turned into chrysalids. I found them in two bunches, one of 11 and the other of 22, but 7 or 8 of the chrysalids went black a couple of days after turning. I have opened two of these, but can't find any signs of ichneumon 'grugs' inside. The first caterpillar when it wanted to turn crawled under some paper I had put into the bottom of the cage to facilitate cleaning—a place where it had no room to turn in. So after that I pasted a 3″ strip of paper round the top of the cage on the outside so as to darken it, and after that they mostly suspended themselves from the top of the cage, except a few that suspended from the leaves of the food. When I found them most of them had changed their skin for the last time, and they fed for five or six weeks after that. I enclose a photo of a group which will give you a fair idea of what they are like. Unfortunately I could not get a panchromatic plate, which would have brought out better the different shades of colouring. The first chrysalis is now changing colour, and will probably come out during the next week."

Some Italian Races of Zygaena transalpina, Esp.— Mr. Hy. J. Turner also exhibited several races of the very variable *Zygaena transalpina* from peninsular Italy, sent to him by Signor Querci, and stated the relationship of the various forms as explained by Dr. Verity of Florence. He said:

"Dr. Verity identifies the *Z. loti* of Esper with the somewhat later-described *Z. transalpina* of the same author, the former being of small size, and comparatively frail build with much extent of red scaling on the underside of the fore-wing, made up of the group of Central European races; the latter of comparatively larger size and stout build without the red scaling on the underside of the fore-wings, made up of the group of more brilliantly coloured races of Italy south of the river Po.

"The race of the Alps and Pyrenees, called *alpina* by M. Oberthür, Dr. Verity calls *alpicola*. In the Po valley and the lower localities of the Alps there is a somewhat more robust

and brighter race he calls *emendata*. Both of these by their red scaling below and other comparative characters belong to the *loti* group.

"The races to the south of these areas Dr. Verity divides into two groups, a mountain group and a maritime group, differing again comparatively in build, brilliancy of colour and size. Along the tops of the Apennines from Liguria to the Abruzzi there is a race of small specimens named *altitudinaria* by Count Turati, frail, narrow wings, thin antennae, etc. Below this race in altitude and intermediate between the *emendata* of the *loti* group and *altitudinaria* in comparative characters is the race *intermedia* of Rocci, which occurs on the low foot-hills of the Apennines; these races produce but few extreme individuals, they are all six-spotted with but little extension of the black border of the hind-wing.

"Further south melanism is strongly developed and even becomes racial. In the Sorrento Peninsula occurs the race *sorrentina*, Stgr., with the predominance of forms having broad or very broad black margins to the hind-wings, often with rays towards the dorsal margin, with occasional five-spotted forms, occasionally with the whole hind-wing darkened, and a few of the yellow spotted *calabrica*. In the Mainarde Mts. at Villa-latina occurs a beautiful race distinct and peculiar in its variation in a large proportion of its specimens by the red becoming pink or yellow. To this race Dr. Verity gives the name *latina*.

"Of the other group there are two races (1) *maritima*, Obth., like *emendata* but brighter and without the red scaling below, and occurring along the Rivieran coast to Genoa, and (2) a very similar race called *transiens* by Rocci, occurring along the coasts further south and at Formia in Caserta producing dark specimens closely approaching the neighbouring race *sorrentina*."

He also questioned whether the relationship of the forms as at present suggested would stand, when the races occurring in other parts of the peninsula had been studied.

Lord Rothschild observed that the same range of variation was exhibited in *Z. ephialtes*.

An Autograph of Charles Darwin.—The Rev. F. D.

Morice exhibited a book of Charles Darwin's ("Descent of Man") given by the author "with kind regards" (autograph) to the late Mr. Roland Trimen.

Remarkable Development in hind leg of a Female Bee.—Mr. Morice also called attention to the very abnormally developed hind-legs of a ♀ bee of the genus *Megachile* from Mesopotamia, apparently belonging to a section of the genus in which no character at all similar had yet been described in either sex. He did not feel able to say for certain whether the character was specific, or a case of monstrosity, but at present inclined towards the former opinion.

Aberrant Plusias.—Lord Rothschild exhibited two aberrant specimens of the genus *Plusia* in which remarkable aberration is very unusual. The one was a specimen of *P. gamma* with deep purplish suffusion, ab. *purpurissa*, Warr., the other a beautiful example of *P. pulchrina* taken near Gloucester, June 21, 1919, by Mr. C. G. Clutterbuck, in which the usual golden Y mark was replaced by a large wedge-shaped golden blotch, the space between the hind-margin and the subterminal line being of a beautiful pink shade.

East African Flatidae.—Dr. C. J. Gahan exhibited specimens of the East African Flatidae named *Ityraea patricia*, Melich., *I. speciosa*, Melich., *I. electa*, Melich., and *I. gregoryi*, Dist., and said he believed them to be all forms of the South African species *Ityraea nigrocincta*, Walk., with which they agreed in structural characters. In a very large series of specimens captured by Mr. Loveridge at Morogora, three of these forms were represented, the one named *patricia* being the most abundant; and specimens of the latter had been taken *in cop.* with *speciosa*. *Ityraea gregoryi*, which was not found at Morogoro, appears to be the predominant form farther north, as, for example, at Kibwesi and in other parts of British East Africa, there taking the place of *patricia*. In all of these forms, the tegmina are more or less distinctly margined with black and show a short transverse streak of varying length running inwards from the margin at the apex of the clavus. *I. patricia* may be distinguished from the other forms by its three-coloured tegmina, which are red at the base, pale bluish green (or blue in the living insect) in the middle, and pale yellow

in the hinder third. In *I. gregoryi*, the tegmina are bright red at the base, and orange red over the rest of their surface, in this respect differing from those of *nigrocincta* in which they are of a pale yellowish tint passing to orange yellow at the base. The black margin is also more distinct in the latter form. In *I. speciosa*, the tegmina, except for a reddish border running alongside the narrow black margin, an orange-yellow spot alongside their scutellar edge, and one or two reddish spots between this and the black transverse bar at the apex of the clavus, are entirely green or yellowish green; and the head, pronotum and scutellum are also green. *I. electa* differs from *speciosa*, which it otherwise very closely resembles, in having the head, pronotum, scutellum, and base of the tegmina, reddish yellow. In both of these forms, the hind-wings are carmine red at the base, whereas in *patricia* they are entirely milk-white, and in *nigrocincta* and *gregoryi* are tinted, but only to a slight extent, with yellow at the base.

An interesting Relic.—Mr. Durrant exhibited the original MS., dated Sept. 28th, 1851, of Lord Walsingham's earliest entomological "discovery" at the age of eight. It reads as follows:—

"I have just found out that the catipillars hind feete are different to its frount ones."

Wednesday, March 3rd, 1920.

Comm. J. J. Walker, M.A., R.N., F.L.S., President, in the Chair.

Election of Fellows.

Messrs. E. H. Blackmore, President of the British Columbia Entomological Society, P.O. Box 221, Victoria, B.C.; Ernest Hargreaves, Zoological Dept., Imperial College of Science, South Kensington, S.W. 7; Arthur Loveridge, Nairobi, British East Africa; and John George Rhynehart, Harristown, Taghmon, Co. Wexford, were elected Fellows of the Society.

Proposed Alteration of the Bye-Laws.

It was announced that a Special Meeting would be called to consider alterations in the Bye-laws proposed by the Council, and these were then read for the first time. Mr. Bethune-Baker proposed that as the first possible opportunity for calling a Special Meeting would be immediately after the ordinary meeting in April, which falls in Easter-week, the Special Meeting should be held immediately before the ordinary meeting on May 5th; this was seconded by Dr. Marshall and carried.

Death of a Fellow.

The President announced the death of Dr. Gordon Hewitt.

Nomination for Fellowship of the Royal Society.

He also announced that Dr. R. C. L. Perkins has been nominated for a Fellowship of the Royal Society.

Exhibitions.

Seasonal Dimorphism in Androconia.—Dr. F. A. Dixey exhibited some outline drawings showing variation in form between the scent-scales of the spring and summer form of certain butterflies, and remarked on them as follows :—

"In the year 1901, when I was working at the scent-scales of the *Pierinae*, I noticed that the plumules of the wet-season form of *Teracolus evagore antigone*, Boisd., differed from those of the dry-season form of the same species. I made drawings at the time of the respective forms; these have not hitherto been published, but in my presidential address in 1910 I referred to this observation in the following words—"The scale [of *T. antigone*] appears to be longer and narrower in the wet-season form than in the dry" (Proc. Ent. Soc. Lond., 1909, p. cii).

"Mr. F. J. Ball, of Brussels, has lately called my attention to the fact that in a paper published in 1914 ('Annales de la Société Entomologique de Belgique,' 1914, p. 170) he has described and figured many instances of a similar seasonal variation in the androconia of European butterflies belonging to the *Lycaeninae, Pierinae* and *Satyrinae*. The first observation in the case of a Lycaenid was made by Dr. Chapman, who

found that the androconia of the first brood of *Agriades thersites*, Cantr., differed from those of the second brood in being broader, and containing more rows of points or 'globules' (Trans. Ent. Soc. Lond., 1911, p. 309, Pl. LIV). The investigation of these structures has been extended by Mr. Ball to many other species of the subfamilies named, with results that are carefully recorded in his paper. In *G. rapae*, Linn., the summer brood has a plumule which is broader in its proximal and narrower in its distal part than that of the brood emerging in the spring; the 'terminal chevron,' as Ball calls the distal margin of the scale from which the fimbriae arise, is more elongated in the former than in the latter. The same differences occur in *G. napi*, Linn.

"The outline drawings I exhibit are roughly copied from Mr. Ball's figures. His plates in the Brussels 'Annales' contain representations of the seasonal forms of plume-scales in *Synchloe daplidice*, Linn., and also of the corresponding forms in *Pararge* and *Coenonympha* (*Satyrinae*) and *Lycaena*, *Cyaniris* and *Everes* (*Lycaeninae*)."

Butterflies from Cyprus. Mr. H. J. Turner exhibited many of the Cyprian Butterflies with which his paper (read later in the evening) was concerned, and explained their characteristic features.

Odonata from Macedonia. Capt. J. Waterston exhibited a set of Macedonian Odonata and made the following remarks :—

The Dragonflies exhibited were collected by myself in 1917–1918, and annotated lists of them have been published in vols. li and lii of "The Entomologist." On the present occasion, it may be of interest to recall the leading facts in the history of one of the species now before you, viz. *Selysiothemis nigra*, Lind. (Libellulidae), which to Entomologists of a quarter of a century ago was little more than a name.

Although its range, as determined by the existing records, is a wide one, the claim of this insect to be included in the fauna of Western Europe rests upon two old and isolated specimens alone. The original example, Van der Linden's type of *Libellula nigra*, described in 1825, was a male from Terracina, on the west coast of Italy. (It may be remarked, in passing, that

Van der Linden confused with our insect the superficially similar species *Sympetrum danae*, Sulz.) The second example was an immature male from Catalonia. This was regarded by de Sélys-Longchamps as a new species of *Urothemis*, a genus to which he also referred Van der Linden's insect, and he described it in 1878 under the name of *Urothemis advena*. After an interval of about twenty years, records began to multiply more rapidly, with the result that the true home of the species was found to lie further towards the East than was formerly suspected. Since 1897 Ris, the author of the monotypic genus *Selysiothemis*, has extended the known distribution to the Kashgar Daria in the East and to the Algerian Sahara in the South, while Bartenef has furnished several records from Palaearctic Asia (the Caucasus, Turkestan, Persia, and Afghanistan).

I met with this insect in great numbers at two or three different localities in Macedonia, and, as my captures were made in circumstances which cannot be regarded as accidental, they confer upon the species a status in the European fauna which it could not derive from the two old and unconfirmed Mediterranean records. According to the information Morton has recently published, members of the British Expeditionary Force in Mesopotamia also found the species very commonly. In Mesopotamia, it would seem, *Selysiothemis* is on the wing from April to June, while in August and September immature examples again appear. The individuals of the earlier batch, moreover, are larger. As it happened, the four specimens taken by myself in Macedonia in the third week of June were all females, and three of them were decidedly immature. The remaining specimens, six in number, were caught late in July or early in August, and all of them were fully adult. It is possible that the flight of this species, which evidently begins later in that country than in Mesopotamia, is continued without any interruption during the month of July. It remained on the wing until the end of August, at all events, but I have no record of its appearance in September. In respect of size, my specimens from Giol Ajak and Lake Adji Geul compare very favourably with those previously recorded.

Although no examples were secured, the species was again

common in August 1918 near Dragomir, along the east side of L. Ardzair. All three localities are in Western Macedonia. I have no notes on *Selysiothemis* in the Struma Valley, where, however, it doubtless occurs. On the other hand, I looked for the species unsuccessfully along the Beshik–Langaza plain and round Stavros, May–June 1918.

The flight is low over dry ground especially when sparsely set with tufts of grass on which the insect often rests. Water surfaces, however, are generally avoided.

I have to thank my friend Mr. Herbert Campion for material assistance in drawing up the foregoing notes.

Forms of Heliconius doris.—Mr. W. J. Kaye exhibited *Heliconius doris*, Linn., from Trinidad, of the blue, green and red forms, and from Colombia a specimen of an *amathusia* form uniting the blue and red form in one, to show the disposition of the hind-wing streaking of the blue, green or red forms. The streaking of the two former always occurs along the vein; while the red form is always between the veins. The following note by Mr. W. Buthn from Trinidad was read, and the comment was made that confirmation of such a remarkable observation was greatly to be desired.

"A female that was either green or blue was observed depositing eggs on upper surface of a leaf of *Passiflora edulis* in the afternoon at about 3–4 early in November; eggs were touching each other, and 129 were laid. Caterpillars emerged six days later. Caterpillars and pupae gregarious, unlike some other species of *Heliconius*; green and blue forms emerged in about equal numbers; from another batch of eggs laid on another leaf at the same time by the same female only red forms emerged."

Lycaenidae from Ceylon. Mr. Riley exhibited some Lycaenids from Ceylon on behalf of Mr. W. Ormiston of Kalupahani. The specimens included :

1. *Zizera lysimon*, Hb. A female with extra spots added irregularly on underside of fore-wing. A similar specimen has already been received by the B.M., also from Ceylon, and several others were taken by Mr. Ormiston at the same time.

2. *Zizera gaika*, Trimen. A similar aberration, also a female and taken at the same place.

3. *Catochrysops pandava*, Horsf. ♀. From N. Ceylon. It differs considerably from the normal larger form with which Mr. Ormiston has taken it at Trincomali in Dec., 1918, and he considers it probably a distinct species. The series in the B.M. is too poor to attempt to decide this point.

4. *Syntarucus* (*Tarucus*) *telicanus* f. *plinius*, Fab. Aberration with coalescent spots.

5. *Nacaduba noreia*, Feld. ♀. This insect described by Felder in 1864 has never since been correctly determined. The name has usually been applied to the tailless form of *N. ardates*. The species here exhibited, however, seems without doubt to be the true *N. noreia*, Feld., with the description of which it very well agrees.

6. *Nacaduba dana*, de Nicé. ♂. Aberration with the markings of underside almost entirely absent.

7. *Nacaduba atrata*, Horsf. Aberration with fore-wings with dissimilar markings. Right wing has additional spot below cell.

8. *Nacaduba nora*, Feld. "Aberration in which the basal strigae are not produced below the cell. It grades perfectly into normal, through other specimens in my collection" (Ormiston).

9. *Chilades laius*, Cram. Aberration taken during extreme dry season.

10. *Arhopala*, sp. ♂ ♀ of an apparently undescribed species.

11. *Aphnaeus nubilus*, Moore. This would appear to be a good species. It is quite constantly different from the *Aphnaeus* known in Ceylon as *A. ictis*, Hew.

12. *A. ictis*, Hew. From Ceylon for comparison.

13. *A. ictis*, Hew. ♀ ♀. Aberrations in which the subapical orange spot is absent or nearly so.

14. *Aphnaeus*, sp. These as far as can be judged are the Race 2 of Ormiston ("Notes on Ceylon Butterflies," Spolia Zeylanica, 1918). They are also considered by Mr. Fairlie, who first met with the form, to be a distinct species. They would appear to differ fairly constantly, but the two poor specimens here shown are the only ones so far seen. They have been brought up so as to make the exhibit of this rather puzzling group as complete as possible.

Most of these specimens have been referred to by Ormiston already (*l.c.*), and have been presented by him to the B.M.

Horned Beetles.—Mr. G. J. Arrow showed a series of lantern slides to illustrate different types of armature occurring in Lamellicorn Beetles, and made the following remarks :—

Various theories have been put forward to account for these armatures. Darwin ("Descent of Man") believed they could be best explained by Sexual Selection, *i. e.* by the exercise of a preference on the part of the females for males with the best-developed horns. This theoretical preference was supported by no evidence of its actual existence in insects, and it is doubtful if any entomologist could be found to profess belief in its existence to-day.

Sexual Selection was rejected by A. R. Wallace, who suggested ("Tropical Nature," 1878) that horns in beetles might be explained as a means for making the bearers less easily swallowed by certain birds—the males being more active than the females, would be more liable to such risks, and therefore in greater need of such protection. But, whilst some horned beetles are very tiny and their horns extremely delicate, others are so huge that their size is sufficient to prevent any bird swallowing them whole, and moreover many of the males of these giant forms show by much more conspicuous coloration, etc., than that of the females that it is the latter, and not the males, to which special protection is accorded.

Reichenau (Kosmos, 1881) put forward the theory that the supposed rudimentary horns of the females were the really important structures, serving as implements for excavation, and that, whilst of no use in the other sex, they had been inherited from the female and had developed to an exaggerated extent.

Lameere (Bull. Acad. Belg., 1904) believes that horns were formerly possessed by all Lamellicorns, even Stagbeetles, Cockchafers, etc., but that they have in many cases been replaced by other forms of sexual dimorphism. He considers their special development in the males to be a form of compensation for the reproductive energy expended by the females.

These various theories are all attempts to explain the more

conspicuous and familiar types of armature, but none of them adequately account for the very diverse forms actually existing, sometimes in one sex only, sometimes in identical or in different forms in both sexes.

Fabre ("Souvenirs Entomologiques") has described the wonderfully elaborate nidification, in which male and female collaborate, of *Copris hispanus* and *C. lunaris* and *Geotrupes typhaeus*, and has observed the employment of the horns by the last. Probably if we knew the habits of other species we should find the armature serving a variety of purposes. In the absence of such information I have found useful evidence in the presence or absence of wear in the digging teeth of the front tibiae of male and female respectively. When the two sexes co-operate the average amount of wear is the same in both; in others the examination of a considerable number of specimens shows the wear confined to the females, and in one interesting case, *Corynoscelis glaucon*, Perty, a Dynastid curiously resembling the very remote *Geotrupes typhaeus*, it is markedly greater in the male. In many of the giant forms there is a great elongation, and consequently reduced muscularity, of the legs of the males.

Such evidence seems to me to indicate that in the very numerous species in which there is an armature in both sexes or in which that of the male is not extravagantly developed, there is collaboration between the sexes, but that when the male is fantastically horned it is invariably a drone, bearing no part in nidification. In the former case the development is restrained by the operation of Natural Selection, which in the latter, while suppressing awkward outgrowths in the female, has had no such effect upon the comparatively unimportant male. It is perhaps not impossible that the conspicuousness of the male of the horned giants, frequently also manifested in these cases in a more brilliant exterior, may by attracting enemies to itself help to save the more important female and so become beneficial to the race.

Fabre's discovery of the existence of a prothoracic protuberance in the pupae of both sexes in the genus *Onthophagus*, although he was entirely wrong in declaring it to have no counterpart in adult beetles, appears to me to have great

significance as indicating the ancestral occurrence of a thoracic horn in both sexes. In what is probably the most ancient group of that immense genus (*O. tarandus*, F., and allied species) male and female have an identical armature.

I believe an armature to have been primitively common to Lamellicornia of both sexes; that it probably had some relation to the insects' habits, which there is reason to suppose were elaborate in the ancestral forms; that there has been a general tendency for the females to lose the armature, perhaps in correspondence with a division of labour between the sexes; and that the armature has developed fantastically in males which have ceased to collaborate with the females, and as a consequence of their diminished importance to the preservation of the species.

New or rare Rhopalocera collected in Central Ceram by Messrs. F. C. and J. Pratt, at elevations from 2500 to 6000 feet, in October and November 1919. —Mr. G. Talbot exhibited the following species on behalf of Mr. J. J. Joicey:—

Troides procus Roths. (1914), ♂ and ♀. The ♂ is a new discovery, and indicates that *procus*, although allied to the *goliath* group from New Guinea, is a distinct species, and was so considered by Rothschild. The cell of the hind-wing is differently shaped. This species may rank with *alexandrae* as the largest *Troides* at present known. Only taken at 2500 ft.

T. supremus Rob. ♂ ♀ shown for comparison.

Papilio weiskei stresemanni Roths. (1915), ♂ and ♀. The ♀ was not obtained by Rothschild's collector. Taken at 6000 ft.

Delias sp. nov., ♂ ♀. The only species known in which the ♀ bears a red band on the fore-wing above. This species is allied on the one hand to *dohertyi* Roths. from Jobi and Biak Islands, and on the other to *negrina* Fbr. from Queensland. Taken at 6000 ft.

Delias stresemanni Roths. (1915), ♂ ♀. The ♀♀ show variation on the underside.

Delias echnida Hew., ♂ ♀. This very rare species has apparently not been recorded since taken by Dr. A. R. Wallace. The ♀ is undescribed, and a specimen exists in

the Joicey Collection taken by J. C. Kershaw in 1909, with locality "Amboina." Taken at 3000 ft. to 6000 ft.

Delias duris Hew., ♂ ♀. Always very rare. Taken at 6000 ft.

Euploea dentiplaga Roths. (1915), ♂ ♀. Taken at 2500 to 6000 ft.

Ideopsis klassika Mart. (= *stresemanni* Roths. 1915), ♂ ♀. Taken at 6000 ft.

Limenitis staudingeri Ribbe, ♂. This very rare and distinct species does not appear to have been recorded since Ribbe made his Ceram Collection. Taken at 3000 ft.

Eriboea subsp. nov. near *jupiter* Butl. A series was taken at 6000 ft. It is of great interest to note that no specimens of *pyrrhus* were sent. It is evident that two species at least are mixed with the *pyrrhus* forms, and quite possibly a third. The form shown is very close to *jupiter*, which we already know from New Guinea, the neighbouring islands and Aru. In *jupiter* Butl. we may have a distinct species. The so-called races of *pyrrhus* now require revision, as one species will be represented by *sempronius* Fbr., which is nearer to *jupiter* than to *pyrrhus*.

Notes made by the Collectors.

Locality.—Central Ceram (within four days of Tehoro on the South coast and five days of Wahai on the North coast). From Tehoro, the place where our camp is placed is visible as a cutting in the mountains. This is due to the extensive felling of the jungle which we carried out. The camp is just where the pass is, in the lowest part of the mountains, and the mean altitude obtained from three aneroids is 6150 ft. The nearest water obtainable on either side is 3000 ft. below. The source of a mountain stream is said to be in a spot at about 5000 ft., but it is quite impossible to make a path to it on account of the precipitous nature of the country. In parts there are sheer drops of 1000 ft. and more. A cocoanut which slipped over was not seen nor heard again. All, of course, is covered in primeval jungle. Rhododendrons are found commonly growing among the trees. There are few animals, and birds are not conspicuously present. The country

is too inaccessible even for deer, which abound in the lower altitudes where the formation is not limestone.

Climate.—The rainfall is heavy, but not nearly so heavy as in New Guinea, though there is great humidity. The temperature was never noticed above 72° or below 58° Fahr. In New Guinea at the same altitude we have had it down to 49° Fahr. A lot depends on the wind. The North-West Monsoon has now set in. This season, though rainy, is perhaps the warmer season in the mountains, but it would be necessary to stay a full year to obtain reliable results on this question. We do not think that in New Guinea and Ceram there is any marked butterfly season, though some things are unquestionably rarer during some months than during others. It will be clear, however, that it would require permanent residence in one place to decide this point, as nearly all things are to a certain extent local, and may be common on one side of a bay and rare on another. It is the same in the mountains, certain ridges having their common and rare species. We have noticed no difference in species on the various sides of the mountains as is so marked in S. America.

From May till September the South-East Monsoon blows, and this is the "dry" season. That is to say, there is less rain than during the North-West, which blows from October till April.

Habits of Delias.—Around about our camp we have felled the jungle in large areas, and men are placed in the trees on the edges of the clearings. Generally speaking the *Delias* males are only found in this way, and this will explain the apparent comparative rarity of this sex in some species. The females are generally taken either in sunny spots in the jungle or flying over the ridges within reach. When the males come over that way they are nearly always out of reach. One magnificent species, undoubtedly new, does not seem to go below 5000 ft. Curiously enough most of the females of this species were taken at 6000 ft., and most of the males at 5000 ft. We think it is a high species. On the wing the female is remarkably like the South American *perente*. This is due to the black upper surface with a beautiful red or orange band

on the upper surface of the fore-wing. The one we think may be *stresemanni* (with the diverse ♀ forms) is like its ally *D. rothschildi* in New Guinea, found as low as 3000 ft. In comparison with New Guinea it is extraordinary that we have so far only found two species confined to the higher altitudes (perhaps *echidna* is not found at the coast, but it is no great rarity at 3000 ft.). We think there must be more species; in fact, we have seen one which seems to belong to the *pratti* and *castaneus* group, but it is larger. Therefore we hope to make a camp near the top of Mount Moerkele, which is the highest mountain in Ceram. It is between 8000 and 9000 ft. The top is nothing but stone and rock.

Thus in summing up :—

Delias dorimene, duris, caeneus and *isse* are found at the coast and in the mountains at 6000 ft.

The two new ones are found above 5000 ft.

D. stresemanni above 3000 ft.

With regard to *Ornithoptera procus*, the insect seems to be very rare, but is most easily obtained in the open country at the foot of Mount Moerkele at 2500 ft. It is obviously not a coast insect, but is a fairly low form corresponding to the true *goliath*, *titan*, *supremus* and *samson* forms in New Guinea. This is not the case with *joiceyi*, which is apparently only found in the steaming valleys surrounding the higher ranges, and we think it doubtful if it descends below 4000 ft. The limit of *O. rothschildi* is probably more 5000 or even 6000 ft. perhaps. With *procus* it is interesting to note that the male bears a delicate perfume which is hard to define. It is not like any particular flower, yet is distinctly pleasant to the human sense. Perhaps the best way to describe it is as the scent emanating from a hot-house of living plants. This characteristic is perhaps not peculiar to *procus*, but we have never noticed it before in any others. Perhaps it has been overlooked, as the scent is only perceptible on placing the wings to the nostrils. There is no smell noticeable in *priamus* and *helena*.

Evidence that the viola, Butl., ♀ f. mim. of Charaxes etheocles, Cr., flies with its model C. epijasius, Reiche.—Prof. Poulton said that at the meeting of last December

he had shown a lantern slide representing these two species captured in the same locality and within a few days of each other. After the meeting he had sent a print of the negative to Lt.-Col. R. S. Wilson, Governor of the Western Desert Province of Egypt, and had asked him if he remembered whether the two butterflies flew together in the Nuba Mountains Province. Col. Wilson replied as follows :—

"*Mersa Matruh, Egypt,*
"7.ii.1920.

"Many thanks for your letter of 11.xii.1919 and for the photos of the *Charaxes* enclosed therein. Yes, the *viola* ♀ form of *etheocles* flies with the *epijasius*, and is almost indistinguishable from it on the wing except for its smaller size. I was out with Capt. Kent Lemon at Talodi when I took my first specimen of the former butterfly, and we both thought it was an *epijasius* until it was netted. Afterwards it was possible to distinguish it with care when on the wing, owing to the difference in size. We both took several *epijasius* round the same tree that day, and later, on several occasions, took them together. The tree particularly favoured was called Arrada (plur. Arrad) locally, viz. *Albizzia amara*, Boirin. The 'Catalogue of Sudan Flowering Plants,' by A. F. Brown, describes it as a large tree with strong timber. It is thornless, loses its leaves in the dry season, and flowers March to May. Its flowers are like those of *Mimosa*, but white instead of yellow. It seeds very freely, and the seed-pods are flat and broad. It belongs to the Mimosa group of the *Leguminosae*. All the *Charaxes* I took in the Nuba Mountains Prov. are partial to it, viz. *varanes*, *epijasius*, and *etheocles*. *C. varanes* when hanging downwards from a twig with closed wings is extraordinarily like a partially broken and dry seed-pod (which is then reddish brown) both in colour and pattern, the small circular markings on the underside of the butterfly looking like the seeds which show through the constricted parts of the pods where they lie."

The attacks of birds on butterflies witnessed in Nyasaland by W. A. Lamborn. The marks of a bird's beak recognisable on rejected wings.—Prof. Poulton

exhibited and illustrated by a lantern slide the examples enclosed in the following letter from Mr. W. A. Lamborn. The method of transport had not caused any deterioration, and the marks of the bird's beak at the base of the wings were quite clear. The other material described in the letter had not as yet been received, but it was thought better to make the letter public without delay in order that the new method of investigation might be known and pursued as soon as possible.

"*Karonga, Nyasaland,*
"*10th December*, 1919.

". . . As a result of two thunderstorms the buds are bursting, and with the appearance of flowers butterflies have become more numerous, especially *Catopsilia florella*, which must, I feel sure, have come by migration, for they have not been breeding hereabouts, the food-plant having been leafless till recently, and there have been none about. Being interested in the question of their sex colour in various localities I have kept a special look-out for them. Just outside my verandah is a *Poinciana regia* (Flamboyant Tree), about 20 ft. in height, just now forming a crimson blaze of open flowers though the leaves are still very small; and this is attracting a host of insects—various Sphingids, especially *Nephele*, at dusk, Chafers and other beetles when it is dark, Hymenoptera, especially Vespids, in the early morning, and when the sun is high *Catopsilia* in considerable numbers, this being the only species of butterfly at all abundant as yet. Underneath the tree I have found frequently, during the last few days, the wings of the butterfly, and the question as to what has been the destructive agent has engaged my attention. Lizards are out of the question: I have studied the tree thoroughly and there are none: neither have I seen here except very rarely any of a size sufficient to be able to tackle a butterfly. The wings collected also do not any of them exhibit the kind of damage one associates with lizards—the base chewed off, much of the wing denuded of scales, crumpled and showing numerous tooth punctures. Birds being the only possible agents, and the early morning when they are still hungry being the most likely time to make any observations,

I concealed myself yesterday, 10th, [?9th] at 9 a.m. among some *Hibiscus* shrubs and watched various birds on the tree. At the end of about half an hour a small yellow bird with black head arrived, perched in a clump of flowers and swooped out at the first *Catopsilia* which came near, returning with the butterfly in its beak to its perch, where, having pulled off the wings one by one, it ate the body and then flew away. Another bird of the same species arrived soon after and also sat among the flowers, from which it swooped out on the first *Catopsilia* arriving to feed close at hand, catching it, tearing off the wings while on its perch and eating the body; and by and by I saw it take and eat a second insect. I am not quite sure how the *Catopsilia* was held, but think it was pressed down beneath one foot on the branch while the bird pulled off the wings. In each instance the body was pulled into three separate bits and so eaten. I obtained some of the wings of the butterfly eaten by the first bird, and some from those taken by the second, and the appearances they present are similar to those seen on many of the wings picked up—linear markings across the wing base without any great denudation of the scales generally.

"I followed the movements of the second bird as far as possible till mid-day, only losing sight of it once or twice for a few seconds, and it then flew down on to the grass and seized and took up into a tree an Orthopteron, which it proceeded to dismember and to eat. I then shot it and examined microscopically the contents of the alimentary canal, for the material other than the head of the Orthopteron was pulped and unrecognisable by the unaided eye. I studied first the rectal contents, and to my joy at once found scales: on comparing these with some scrapings from the wing of a *Catopsilia* I found many identical. The stomach contents of course exhibited them in great abundance. An important point I think is that though the bird had been seen to eat two butterflies barely two hours previously, I could recognise no portions of them except with the aid of the microscope. This rapidity of digestion may explain how it is that butterflies' bodies are so rarely found in the stomach contents of birds.

The poor bird, very badly skinned I am afraid, is labelled

(279), and I have preserved the stomach contents (279*a*) and contents of intestine (279*b*) in about 40% spirit.

" In the course of the afternoon I saw another bird about the same size but of another species dashing out in unsuccessful pursuit of a *Catopsilia*, and a third bird, which as before swooped out from a clump of flowers after another of the butterflies, but without any luck.

" 11*th December*.—I saw this morning a third species of bird, rather larger than the other two so far seen butterfly catching—a black one with forked tail and a bright crimson iris—dart out and catch a *Catopsilia*, which it ate all except one wing which I could not find.

" I have devoted some time to-day to a more critical study of the *Catopsilia* wings picked up under the trees near the house, and have discovered a most interesting point—that many actually exhibit a V-shaped mark (due to denudation of the scales) towards the costal base, often directly across the nervures and sometimes rather obliquely, the marks corresponding on both sides of the wing. This is unquestionably and I am sure you must agree, the mark of a bird's bill, and in one or two cases the marks are particularly instructive, because one can see that the bird's first attempt to pull off the wing was unsuccessful, the bill having slipped, and that then a second attempt which must have been more successful was made. I have labelled many of the specimens which show this mark particularly well, in the series (303, 304, 305, 306), and I invite your attention especially to a headless butterfly in series (303) which shows, across the base of one hind-wing, a beautifully sharply defined impress of a bird's beak.

" In cases in which there are linear markings only across the wing it must almost necessarily be conceded that these have been produced by birds, if for no other reason than that the marks are paralleled in the wings which I actually saw torn off by the bird. I shall await with considerable interest your examination of the Zomba series of wings, comprising far more varied butterflies, though, even if these marks are not shown, it by no means follows that they were not killed by birds, for the markings may have become

obliterated in the course of the vicissitudes the wings were subjected to during an indefinite period before I came along to pick them up—further damage by other insects, scraping as they were blown about by the wind or pelted by rain.

"13*th December*.—I have once again seen my yellow bird with black head attack a *Catopsilia*, swooping out a short distance from its lurking-place among a mass of *Poinciana* flowers on the advancing butterfly, a mode of attack under easy circumstances which, as I see in the Proc. Ent. Soc., Pt. I, 1915, p. xxxvi, in Swynnerton's paper, had long before been suggested as probable by Dr. Marshall.

"My examination a day or two ago of the contents of the alimentary canal of the bird and my further perusal of Swynnerton's paper, or rather reply to Colonel Manders, has induced me to undertake the examination of a series of birds' droppings collected under my *Poinciana* and other trees likely to attract butterflies. The results have been to me rather surprising. Up to date I have examined under a low-power objective thirty pellets, seventeen of which contain the scales of Lepidoptera, I believe *Catopsilia*. But my own knowledge of insect histology is very limited, and I feel that it would be better for some one having a wider experience—perhaps Dr. Eltringham—to express an opinion on them, and so I have put aside all pellets in which I have found the scales (308), and if he is able to spare the time I am sure it will afford him no little recreation to put his knowledge of the histology of the fragments to the test by identifying the disjuncta membra of a whole host of insects besides the butterflies, much as when I was a medical student it used to be a question of pride in the work to be able to recognise all sorts of odd bits of shafts, tubercles and epiphyses of bones. I will examine if possible exactly one hundred pellets of excreta.

"A week or two ago I felt sure I saw a wagtail offering to a young one soliciting food the body of a *Catopsilia* with part of one wing attached; yet I thought I might be mistaken, because I have rarely seen the birds catching food above-ground, though when in 1914 I fired the grass in tsetse country, hoping to see if any birds took toll of the flies driven before the flames, I remember the same sort of wagtails taking

many Orthoptera high in the air. It seems, too, to be the general opinion that these birds feed habitually on smaller insects. However, it occurred to me to examine the excreta which these birds often drop on my verandah, for there is a family of them with which I am on friendly terms, and when I am alone in the house they always come and very often enter. These pellets do contain the scales of Lepidoptera, I believe Pierine, and so I will pack these separately and obtain some, as to the source of which there will be no possibility of doubt, by watching the birds.

"14*th December*.—I saw to-day a black-headed yellow bird take a *Catopsilia* and dismember it in the usual way, but I only obtained a bit of wing, which shows well the beak mark. It has just occurred to me that I can send you in this letter a few wing fragments bearing this mark, and a specimen of excreta.

"In considering the question of bats as destroying insects it has occurred to me that I might examine their excreta too, so I entered a room in the house shut nearly all the time I have been here and infested by the animals. Here the floor is covered with their excreta, which I examined, finding numerous scales of Lepidoptera, doubtless moths, a number of which, for some reason or other, they must have brought in, for there are on the floor many wing fragments, which I am collecting, labelling both excreta and wings.

"With further reference to the question of birds taking *Catopsilia*, there is no dearth of other insects here, Orthoptera now swarming. I saw an old man last night collecting them—Locustids—which he assured me he was going to boil and eat."

Observations on the enemies of the larvae of the Pierine butterfly Catopsilia florella in East Africa.—Prof. Poulton said that he had also received the following interesting notes by Mr. Lamborn :—

"*Karonga*,
"12*th December*, 1919.

"I have been often going to give you a little account, based on some notes made a year ago at Lindi, of the larvae of *C. florella* and their enemies. I now append it :—

" In an account of the ways of the fly *Bengalia* reference was made as to the escape, by making convulsive wriggles, of these larvae from the fly bent on seizing them and sucking their juices. The further value of the action on the part of the larvae was shown in the course of a study of the habits of the wasp *Eumenes maxillosa*, de G., which in E. Africa stores its nest with the larvae, a prey different from that stored by the species in S. Nigeria, which there collects Noctuid larvae.

" At Lindi in December 1918 the Eumenids were so abundant that many opportunities were afforded of watching them, and there was an absolute plague of the Pierine larvae. A Eumenid flies round and round the bush, a leguminous plant, on which the larvae feed, examining the larvae in turn, especially the larger ones. Unless almost at maturity the larva shows no appreciation of the presence of its enemy, nor does the wasp molest it; for it preys only on those fully grown. But when the wasp approaches a mature larva, it usually shows instant alarm, evading its would-be captor by immediately dropping unsupported by silk, and, should it fall on a leaf, wriggling violently, so as at once to reach the ground. In this way it usually escapes, especially if it has fallen from a height; for the wasp usually gives up the quest at once, though in a few cases in which the attack was made on a larva near the ground, the wasp was seen to settle and to wander in search of it in a perfunctory way. In no single instance, however, was a larva seen to be taken when once it had fallen.

" When, owing to lack of promptitude in dropping, a larva is seized by the Eumenid, the first act of the captor — gripping it behind the head and often pinning it to the midrib of the leaf on which during the warmer hours the larva rests — is to sting it ventrally in the centre of each of the first three segments. The larva forthwith becomes motionless, and the wasp then endeavours to lift it. This it is frequently at first unable to do, for, probably owing to tonic muscular spasm induced by the injected poison, the abdominal feet still firmly grip the leaf, in which case the wasp, supporting the larva with its legs, proceeds with its mandibles to disengage in

turn each pair of feet. It then invariably flies off with its prey for a few yards and usually to a higher elevation. Here it makes its toilet, rubbing its legs together and cleaning them between its mandibles, and it then proceeds to sting its victim again in the ventral surface of each segment, usually from before backwards, commencing at the 4th and sometimes in regular order, though this is not invariable. The wasp then flies high with its prey and is gone.

"In the vicinity of Domira Bay, Lake Nyasa, the predaceous enemies commonly attacking these larvae seemed to be ants, especially Camponotids, which made organised hunts for them. In such cases the larvae invariably made their bid for safety by means different from those employed against the attack of the Eumenid, letting themselves down by a thread and remaining suspended in mid-air until the danger had passed. In this case it seemed to be the younger larvae rather than the older ones which were sought by the ants."

Papers.

The following papers were read:—

"Butterflies of Cyprus," by H. J. Turner, F.E.S.

"An undescribed Lycaenid from Cyprus, *Glaucopsyche paphos*, n. sp.," by T. A. Chapman, M.D., F.R.S., etc.

Wednesday, March 17th, 1920.

Comm. J. J. Walker, M.A., R.N., F.L.S., President, in the Chair.

Election of Fellows.

Messrs. Christopher Arthington Cheetham, Wheatfield, Old Farnley, Leeds; G. S. Cotterell, Newlyn, Gerrard's Cross; Harry Leon Gauntlett, F.Z.S., M.R.C.S., L.R.C.P., A.K.C., 45, Hotham Road, Putney, S.W. 15; Thomas Frederic Marriner, 2, Brunswick St., Carlisle; C. Smee, 6, Wildwood Road, Golders Green, N.W. 4; and Dr. B. Uvaroff, the Georgian Museum, Tiflis, Transcaucasia, were elected Fellows of the Society.

Proposed Alteration of Bye-Laws.

The proposed alterations in the Bye-laws were read for the second time.

Exhibitions.

Varieties of British Lepidoptera.—Prof. Poulton exhibited on behalf of Mr. F. C. Woodforde the following varieties from the collection of British insects in the Hope Department at Oxford.

1. *Chrysophanus phlaeas*, L., ab. *schmidtii*, Gerh., Burnt Woods, Market Drayton, N. Staffs.: Sept. 8, 1917. F. C. Woodforde.

2. A variety of the same species with the coppery area of the fore-wing replaced by a smoky ochreous. The same locality: Aug. 5, 1918. H. F. Onions.

3. The var. *eleus*, F., of the same species, Milford, Surrey: July 29, 1908. From the collection of the late Lt. R. J. Champion.

4. *Cyaniris argiolus*, L., var. with radiate spots on the hind-wing underside, the fore-wing spotless. Near Ashurst Lodge, New Forest: May 8, 1915. F. C. W.

This variety approaches the ab. *subtus-radiata*, Oberth., taken at Rennes and figured by M. Charles Oberthür (Études d'Entomologie, XX, Pl. iii, fig. 24). The figure, however, shows on the fore-wing under surface the existence of large spots of which the one next the costa is considerably elongated. The spots on the hind-wing are exactly similar to those of the exhibited specimen. M. Oberthür remarks: "C'est l'échantillon le plus characterisé que nous connaissions pour le développement de ses points noirs en dessous."

5. *Catocala nupta*, L., var. with the red of the hind-wings replaced by a dark maroon colour. Taken at light, Guildford: Sept. 2, 1907. From Coll. R. J. Champion.

The Stratiomyid fly Beris vallata captured with its Tenthredinid models.—Prof. Poulton exhibited a series of 6 examples of *Beris vallata*, Forst., captured with the following *Tenthredinidae*—2 ♀ *Dolerus aericeps*, Th., 1 ♂ *Selandria serva*, F., 4 ♂ *Athalia lineolata*, Lep., by Mr. A. H. Hamm, on July 13, 1907. All 13 insects were taken from flowers,

chiefly Umbelliferae, growing over a small area of Hogley Bog, Cowley, near Oxford. The first-named sawfly was far less perfect as a model than the other two, the last-named being the most perfect.

Entomological-Meteorological Records.—Major H. C. Gunton exhibited a diagram referring to Macrolepidoptera of the 1919 season in order to suggest a graphical method of recording observations of the appearance and habits of insects in relation to weather conditions.

On a sheet of squared tracing cloth (each square having sides one-tenth of an inch) the names of the species of insects are tabulated vertically on the left-hand side in the order in which they appeared on the wing, while along the top and bottom the dates are written, so that there is one horizontal row of squares for each species and one vertical row for each date. By means of different symbols representing sallow, sugar, ivy, light, "settled" and "in flight," the circumstances in which each observation is made are recorded in the appropriate square.

The lower portion of the same sheet is devoted to particulars of the weather for each day, plotted to convenient scales and including rainfall, humidity, barometer, maximum and minimum temperature, direction and strength of wind, and general character of weather, using the same conventions as those employed by the Meteorological Office. The quarters of the moon are also indicated.

It is claimed that systematic records plotted in this manner have the following advantages :—

(1) The species on the wing throughout the year, the order of appearance and the rate at which they successively appear, the length of existence in the perfect state, and the occurrence of two or more broods in certain cases can be seen at a glance.

(2) The simultaneous appearance on the wing of different species of butterfly occurring at the same time in any locality is largely a matter of a reasonably warm day and sunshine, but in the cases of the moths there is a much more subtle combination of conditions which occasionally produces extraordinary results. The diagram facilitates the study of these conditions; for example, it recorded in the most compact

manner that on the 6th April the greatest number of species were observed at sallow, the minimum temperature being 45° F., or 6° F. above the mean, the weather overcast and quiet, the humidity 70 per cent., and the moon, in the first quarter, setting early.

(3) The comparison of diagrams corresponding to different years should also facilitate the study of the effect of weather on the appearance of species, having regard to their occurrence during the winter in the egg, larva, pupa or perfect state.

(4) Apart from the effect of the weather on time of appearance, there is room for further investigation as to its effects, direct and indirect, on the abundance or scarcity of a species. When one considers the very great differences between the simultaneous states of different species, that, as regards weather, one insect's meat is another's poison, and that any one species may have encountered favourable conditions during one stage but unfavourable during another, it seems clear that the subject is so complex that it can only be analysed and the results expounded by the comparison of systematic records.

(5) Another interesting line of investigation suggested by such diagrams is the effect which a sudden setting in of unfavourable weather, in the middle of the period of emergence, will have on the propagation of a species, having regard to the fact that the males usually emerge a few days before the females.

(6) There are still some problems to be solved bearing on immigration. Here, again, simultaneous records in different localities might throw further light on this subject by indicating the weather conditions, the points of arrival, and the general directions in which the immigrants spread themselves over the country.

A copy of the Diagram can be seen at the Society's Library.

Birds and Butterflies.—Dr. G. D. H. Carpenter said that since many naturalists believe that birds do not eat butterflies no case of such an occurrence should be left unrecorded; on Feb. 15th of this year about mid-day he saw a male Brimstone Butterfly fly through the garden at Oxford.

and three sparrows that were on the ground leapt into the air and, fluttering clumsily, attempted to catch it; the butterfly easily evaded the birds.

Life-histories of some Coleoptera.—Mr. H. Main exhibited Lantern Slides illustrating the life-history of the Beetles *Copris lunaris*, *Onthophagus vacca*, and *Necrophorus humator*.

Papers.

The following papers were read :—

"A contribution to our knowledge of the Life-history of the Stick Insect, *Carausius morosus*, Br.," by George Talbot, F.E.S.

"A Record of Insect Migration in Tropical America," by C. B. Williams, M.A., F.E.S.

"The Geographical Factor in Mimicry," by F. A. Dixey, M.A., M.D., F.R.S., etc.

Wednesday, April 7th, 1920.

Mr. W. G. Sheldon, F.Z.S., Vice-President, in the Chair.

Death of a Fellow.

The death was announced of the Rev. Stephen Henry Gorham, the oldest Fellow of the Society, who joined it as far back as 1855.

Election of Fellows.

Mr. C. F. C. Beeson, Indian Forest Service, Forest Recorder Institute, Dehra Dun, U.P., India; Capt. Bushell, Imperial Bureau of Entomology, Natural History Museum, S. Kensington, S.W. 7; Major H. C. Gunton, M.B.E., Hobart, Gerrard's Cross, Bucks; Messrs. Owen Huth-Walters, M.A., Knoll Cottage, Ufford, Woodbridge, Suffolk; Percy I. Lathy, Curator to Mme. Horrack-Fournier, 90, Boulevard Malesherbes, and 70, Boulevard August-Blanqui, Paris; and Prof. Benedicto Raymundo, Director of the Museum of the Agricultural Society of Rio di Janeiro, 76, rua Senador Alencar, Rio di Janeiro, Brazil, were elected Fellows of the Society.

Exhibitions.

Rare British Beetle.—Mr. Bedwell exhibited a specimen of the beetle *Otiorrhynchus ligustici*, L., taken near Ventnor, one of the rarest of the British weevils, of which there has been no recent record.

Fluorescence in Lepidoptera.—Drs. J. C. Mottram, F.Z.S., and E. A. Cockayne, D.M., F.R.C.P., gave a demonstration of fluorescence in Lepidoptera by ultra-violet radiation, of which they have submitted the following account. The demonstration has only recently become possible as a result of an invention of Prof. Wood of Baltimore University. Prof. Wood has produced a glass which, whilst allowing ultra-violet radiation to pass, is opaque to light. It is transparent to radiation of wave-lengths lying between 3900 and 3100 A.V. It also allows a narrow band of red light to pass; this can, however, be avoided by using a quartz mercury vapour lamp, which is deficient in this light. Used in this way a beam of invisible ultra-violet radiation is obtained. A similar glass is now being made in this country by Messrs. Chance Bros.

This radiation is especially useful for the examination of objects for fluorescence, so much so that a great many objects not hitherto known to be fluorescent were found to be so. It would seem to be a delicate test because a great contrast is produced between non-fluorescent objects, which appear black no matter what their local coloration, and fluorescent objects which glow more or less brightly.

In view of the interest which physicists have taken in the brilliant coloration of many birds and insects in an endeavour to explain them on a physical basis,* it occurred to us that an examination in ultra-violet radiation would go far to decide whether or no fluorescence played any part in these brilliant colours. The first insects examined were various Lycaenidae and other irridescent species, chiefly on account of the paper by Sims,† suggesting that their colour is due to a fluorescent pigment.

We chose a number of representative British and Tropical Lycaenidae, including *Agriades coridon* and *A. thetis*, and a *Morpho*, as examples of irridescent blues. Purples and

* Lord Rayleigh, Philos. Mag., 6th Series, No. 217.

† H. M. Sims, Canadian Entomologist, 1915, p. 161.

purplish blues were represented by *Apatura ilia*, *Terinos poros*, *Isamia superba*, *Elymnias casiphone* and the Castniid moth *Cyclosia ampliatum*, copper by *Chrysophanus rutilus*, *Rumicia phlaeas* and a male *Zegris chrysomallus*, and blue-green and green by *Papilio blumei*, *P. milon*, *P. philenor*, *Zygaena filipendulae*, *Ino statices* and others. We also examined some Pyrales, which showed a mother-of-pearl irridescence, the pearly underside of *Agraulis renulia*, and the metallic *Plusia festucae*, *P. chrysitis*, *P. moneta* and *Spatalia plusiotis*. None of these showed any fluorescence. Later on we examined most of the British moths and a large number of Tropical butterflies and moths belonging to widely different groups, but only a very small proportion proved to be fluorescent. The glistening yellow hind-wings of *Troides* (*Ornithoptera*) *helena* and *T. darsius*, Gray, were very fluorescent, as were the yellow markings of *T. haliphron* and *T. hypolitus*. The duller yellow of the females was less fluorescent than that of the males. The yellow on the abdomen of the males of *T. alexandrae*, *T. poseidon*, *T. urvilleana*, Guér., and *T. croesus*, Wall., and the thin yellow areas on the hind-wings of the last-named species were fluorescent, but the other brightly coloured portions were non-fluorescent.

The following is a list of other fluorescent species.

Geometridae.—Opisthograptis luteolata, Dup., *O. tridentifera*, Moore, *Scoria lineata*, Scop. (*dealbata*, L.), *Aspilates gilvaria*, F., *Venilia himalayica*, Koll., *Corymica specularia*, Moore (very slight fluorescence), *Euctenurapteryx maculicaudaria*, Motsch., *Ourapteryx sambucaria*, L., *O. ebuleata*, Guen., *O. pluristrigata*, Warr., *O. clara*, Butl., *O. persica*, Mén., *O. nivea*, Butl., *O. sciticaudaria*, Walk., *O. picticaudaria*, Walk., *O. primularis*, Butl., *Enurapteryx nigrociliaria*, Leech, *Myrteta ocernaria*, Swnh., *Orthocabera sericea*, Butl., *Sirinopteryx rufivinctata*, Walk., *Vindusara metachromata*, Walk.

Uraniidae.—Urania rhiphaeus, Drury (white fringes and tails fluorescent), *Epiplema himala*, Butler.

Hepialidae.—Hepialus humuli, L. (male).

Arctiadae.—Hylophila bicolorana, Fuesl. (white hind-wings), *Halias prasinana* (white hind-wings of female), *H. sylpha* (white hind-wings of female).

Lycaenidae.—Curetis acuta, *Cyaniris argiolus*, L. (undersides slightly fluorescent).

The most brilliant are *Euctemurapteryx*, *Ourapteryx* and *Sirinopteryx*. The closely allied *Thinopteryx* does not fluoresce. *Aspilates strigillaria*, Hb., is non-fluorescent, though *A. gilvaria* is one of the brightest in ultra-violet radiation.

Abraxas, which is closely allied to *Vindusara* in structure and resembles it in colour and markings, shows no fluorescence, nor does the white Uraniid *Micronia aculeata*, Guen. It will be interesting to examine genera allied to those which we have found to be fluorescent. In the case of the *Geometridae* Mr. Prout has promised to help us. All the species, which we have discovered to be fluorescent so far are whitish or yellow, but whether it is due to the same pigment in the different groups we are unable to state.

By carefully denuding an area of wing of its scales on both the upper and under sides we found that the membrane is not fluorescent.

The scales of *T. helena* after most of the pigment has been dissolved out still show their strong longitudinal and less-marked transverse striae.

The table on p. xxxix shows the effect of a few chemical reagents, but it must be pointed out that acetic acid gives a colourless solution slightly fluorescent in ultra-violet radiation in the case of non-fluorescent species such as *Diaphora mendica* and *Abraxas ulmata*.

The discovery raises the question of whether the fluorescence is of any value to the insects. It is generally accepted that the male of *Hepialus humuli* is coloured white in order to attract the female during his hovering flight at dusk. The fact that the white is fluorescent probably aids the female, which is non-fluorescent, in her search. It is interesting that the white males from the Shetlands are much less fluorescent than English ones, those with red markings on a white ground only very slightly fluorescent, and those coloured like females are non-fluorescent. It is so light when the males fly in the Shetlands, that the white coloration and fluorescence are not of much use.

In the case of the Geometers both sexes are equally fluores-

cent. All are light-coloured and therefore conspicuous on the wing at dusk, and their fluorescence must add to their visibility.

The *Ornithoptera* fly high up in the full sunlight, but their pattern is obviously designed to attract notice, and the peculiarly bright and glistening appearance of the yellow part of their wings, which is unlike the yellow of any other butterflies, may be due to the fact that they are fluorescent.

	Troides helena.	*Troides darsius.*	*Opisthograptis luteolata.*	*Ourapteryx sambucaria.*
Potassium hydrate 10%.	Readily soluble in cold. Dark orange solution fluorescent in ultra-violet radiation.		Readily soluble in cold. Dark orange solution fluorescent in ultra-violet radiation.	Readily soluble in cold. Dark orange solution fluorescent in ultra-violet radiation.
Glacial acetic acid.	Soluble with difficulty on heating. Pale yellow solution. Slight green fluorescence by daylight. Well-marked green fluorescence in ultra-violet radiation.	Readily soluble on heating. Bright yellow solution with green fluorescence in daylight. Well-marked green fluorescence in ultra-violet radiation.	Readily soluble in cold. Bright yellow solution with marked green fluorescence by daylight and in ultra-violet radiation.	Readily soluble in cold. Pale yellow solution. No fluorescence in daylight. Well-marked pale bluish fluorescence in ultra-violet radiation.
Ethyl and methyl alcohol.	Insoluble.		Slightly soluble. Pale yellow solution fluorescent in ultra-violet radiation.	Slightly soluble. Pale yellow solution fluorescent in ultra-violet radiation.
Chloroform, ether, xylol, petrol, benzine.	Insoluble.		Insoluble.	Insoluble.

If solution in glacial acetic acid is evaporated to dryness, water gives a deep yellow non-fluorescent solution, ethyl alcohol a pale yellow very fluorescent one in the case of *O. luteolata*.

Epping Forest.

The SECRETARY read a letter from the Essex Field Club protesting against a Parliamentary Bill for the permanent alienation of parts of Wanstead Flats and Epping Forest for allotments, and on his motion, seconded by Lord ROTHSCHILD, it was unanimously resolved to send a letter in similar terms to the Prime Minister, and others who might be interested in supporting the protest.

Wednesday, May 5th, 1920.

Special Meeting.

Comm. J. J. Walker, M.A., R.N., F.L.S., President, in the Chair.

The Requisition of the Special Meeting signed by the President and six other members of the Council, was read from the Chair.

Mr. Bethune-Baker proposed that the suggested alterations in the Bye-laws be received—seconded by Lord Rothschild and carried. The suggested alterations were then put separately before the meeting from the Chair.

Chap. II. *Constitution.*

The Society shall consist of Honorary and Ordinary Fellows.

Proposal.—After the word "Honorary" insert the words "Special Life."

Carried on the motion of Mr. Bagnall, seconded by Mr. S. Edwards.

Chap. III. *Management.*

. . . No Fellow shall be eligible as an ordinary Member of the Council until he shall have been a Fellow for three consecutive years, nor shall he serve for more than three years successively.

Proposal.—Seventh line, after the words "nor shall" insert in place of the word "he" "any Fellow, including Vice-Presidents and Co-opted Members."

This addition, which was in accordance with a standing order of the Council, was rendered necessary by the question being raised whether Vice-Presidents were "ordinary" members and whether the portion of a year served by a Co-opted Member should count in his three years. The proposal was carried on the motion of Mr. H. J. Turner, seconded by the Rev. F. D. Morice.

CHAP. X. *Librarian.*

2. The Council may employ a Sub-Librarian,

Proposal.—Section 2, First Line, after the word "Sub-Librarian" insert "or other Official."

After the end of Section 2 add :

Section 3. The Sub-Librarian or other Official shall, under the authority of the Council, be responsible for the safe keeping of the property of the Society.

It was explained that on removal to other premises the work of the Resident Official would be by no means confined to the Library, and that the title Sub-Librarian would no longer be applicable. The first alteration was carried on the motion of Mr. H. J. TURNER, seconded by Dr. COCKAYNE, the second on that of Mr. DURRANT, seconded by Dr. CAMERON.

CHAP. XI. *Library Regulations.*

Proposal.—Before present Sections add a new Section :

Section 1. Any Fellow shall be allowed the loan of Books from the Library, under such regulations, and with such exceptions and restrictions, as the Council shall from time to time determine.

Carried after some discussion, on the motion of Mr. BETHUNE-BAKER, seconded by Lord ROTHSCHILD.

Proposal.—After Chap. XI. add new Chapter headed, *Election of Council*, transferring thereto Sections 3, 4, 5, 6, 7, 8, 9 and 10 of Present Chapter XX.

Carried without discussion on the motion of Mr. BETHUNE-BAKER, seconded by Mr. S. EDWARDS.

CHAP. XII. *Election of Fellows.*

4. Fellows shall sign the Obligation Book of the Society at the first Ordinary Meeting of the Society at which they are present, and shall then be admitted by the President.

Proposal.—Section 4. Delete the words "by the President" and add "in manner and form following ; The President

taking him by the hand shall say: A.B. in the name and by the authority of the Entomological Society of London, I hereby admit you a Fellow thereof."

Add two new Sections:

5. Every Fellow shall on election have immediate notice conveyed to him by the Secretary of his election, accompanied by a copy of the Charter and Bye-laws.

6. Every Fellow on election shall sign an obligation for the regular payment of his Annual Contribution, so long as he shall continue a Fellow, and if any Fellow shall not sign such obligation within six months after his election, the said election shall become void.

The addition to Section 4, which crystallises the invariable custom of the Society, was carried without comment on the motion of Mr. Durrant, seconded by Mr. Lloyd.

The new Section 5 was also passed without comment on the motion of Mr. E. E. Green, seconded by Lieut. Ashby.

Mr. P. A. Buxton pointed out that a hardship might be inflicted in some cases by the new Section 6; there was for instance at present a newly elected Fellow in Tiflis without any means of postal communication, and Mr. Kaye proposed and Mr. Buxton seconded an amendment to add the words "at the discretion of the Council." The Treasurer pointed out that this would involve a reference to the Council on each separate occasion, and Mr. Tonge suggested altering the last three words to "may be cancelled"; Lord Rothschild suggested adding the words "unless the Council shall otherwise decide," and Mr. Kaye then withdrew his amendment and seconded Lord Rothschild's which was carried. The new section as amended was carried on the motion of Mr. Bethune-Baker, seconded by Dr. Gahan.

Chap. XIII. *Admission Fee and Annual Contribution.*

1. The Admission Fee shall be £2 2*s*., the Annual Contribution £1 1*s*.

2. Fellows permanently resident out of the United Kingdom shall pay the Annual Contribution, but shall be exempt from payment of any Admission Fee.

3. The composition for Life Fellowship, in lieu of the Annual Contribution, shall be £15 15*s*.

4. The Annual Contribution shall become due on the 1st day of January in advance; any Fellow elected after September will not be called upon for his Contribution for that year, unless he desires to receive the Transactions of the Society for the year in which he is elected.

Proposal.—Delete present Chapter and substitute :

Section 1. Every Fellow upon his election shall pay the sum of Three Guineas for his Admission Fee, and if any Fellow shall fail to pay such sum within six months after his election the said election shall become void.

Section 2. Every Fellow shall upon his election pay the first Annual Contribution of Two Guineas, and if any Fellow shall fail to pay such sum within six months after his election the said election shall become void. He shall pay the like sum annually in advance on the 1st day of January in each year, provided however that any Fellow elected after September in each year will not be called upon to pay his Contribution unless he desires to receive the Transactions for the year in which he is elected.

Section 3. Every Fellow elected before January 1st, 1921, shall pay the Annual Contribution of Two Guineas unless he does not desire to receive the Publications of the Society, in which case his Annual Contribution shall be One Guinea per annum.

The Treasurer having explained the financial necessity for these alterations, Mr. Kaye proposed as an amendment that the words "unless the Council shall otherwise decide" should be added after the word "void" in Section 1; seconded by Mr. H. J. Turner and carried. The section as amended was then carried on the motion of Mr. Durrant, seconded by the Treasurer.

Lord Rothschild proposed as an amendment in Section 2 that the same words be added after the word "void." This was seconded by Mr. Durrant and carried, and the amended section was passed on the motion of Mr. Bethune-Baker, seconded by Lieut. Ashby.

Section 3 gave rise to several questions and considerable discussion. Mr. Donisthorpe raised the question whether it would be legally possible to raise the subscription of Fellows already elected, and the Treasurer replied that legal opinion had been taken, and that it was permissible, the Charter giving power to the Society to alter *any* bye-laws. Mr. Lloyd pointed out that the wording of the section might be held to include those who had already paid a life composition. It was explained that their position was unassailable, but eventually it was proposed by Mr. Lloyd, seconded by Mr. Simes, and carried, that the words "Except in the case of those who have already compounded" be added at the beginning of the section. A long discussion took place as to the position of those who continued to pay a guinea subscription, and Mr. Main proposed and Mr. Turner seconded an amendment that the word "Transactions" be substituted for "Publications." This was carried by 24 votes to 20, and the section with both amendments was then carried on the motion of Mr. Bethune-Baker, seconded by Mr. S. Edwards.

[The general effect of the new Bye-law will be that all Fellows, wherever residing, elected after January 1921 will pay an entrance-fee of three guineas, that life compositions (apart from those already effected) are abolished, and that the usual subscription for all Fellows will be two guineas, but that Fellows elected before January 1921 have the option of continuing to pay one guinea, receiving only the Proceedings and not the Transactions of the Society.]

Chap. XIV. *Withdrawal and Removal of Fellows.*

3. In the month of November in each year the Council shall cause to be suspended in the Library of the Society a list of the Fellows who owe more than two Annual Contributions. If the Contribution due from any Fellow named in the said list shall not have been paid within three months after the first suspension of the list, the Council may remove such Fellow from the Society, but notwithstanding such removal any Fellow so removed shall continue liable to pay, and may be sued for the recovery of any money due from him to the

Society. The Council may remit wholly, or in part, the Entrance Fee payable by any former Fellow rejoining the Society.

Proposal.—Delete, in Section 3, the words "In the month of November," and substitute for them the words "On the first day of September."

Section 3, line 10, after the word "Society," insert "The Council may cause the name of any Fellow removed under this Section, with the reason for his removal, to be printed in the Proceedings of the year in which they are removed."

Section 3, delete the words in the 11th and 12th lines, "Entrance Fee payable by any former Fellow rejoining the Society" and add "The Contributions due from any Fellow."

The first and third alterations were passed without discussion, the former on the motion of Mr. LLOYD, seconded by Dr. MARSHALL, and the latter on that of Mr. WHEELER with the same seconder. An amusing discussion took place on the grammatical aspect of the second suggested alteration, which was eventually adopted on the motion of Mr. TURNER, seconded by Lieut. ASHBY, with the substitution of the words "he is" for "they are" in the last line.

CHAP. XV. *Privileges of Fellows.*

3. A Fellow shall not be entitled to vote on any occasion until he shall have paid his Contribution for the year last past.

Proposal.—Delete present Section 3 and substitute the following:

Section 3. No person shall have his name printed in the Annual List of Fellows of the Society, until such person shall have paid the Admission Fees and signed the obligation for the payment of Annual Contributions, and no such person shall have liberty to vote at any Election or Meeting of the Society before he shall have been admitted as directed in Chapter XII, Section 4.

Adopted on the motion of Dr. ELTRINGHAM, seconded by Mr. DURRANT.

Proposal.—After CHAP. XVII.

Add a new Chapter headed *Benefactions.*

Section 1. In the printed Proceedings of the Society an annual record shall be kept of all donations, so far as known, that have at any time been made to the Society, of the value of £20 and upwards.

Section 2. In every volume presented to and accepted by the Society, a notice shall be inserted, and when necessary be renewed, containing the name of the donor and the date of the gift.

Adopted on the motion of Dr. NEAVE, seconded by Mr. DURRANT.

CHAP. XIX. *Special Meeting.*

1. Upon the requisition of six or more Fellows, presented to the President and Council, a Special General Meeting of the Society shall be convened;

Proposal.—Section 1. Add before the words "upon the requisition" the words "By resolution of the Council or."

Adopted on the motion of Mr. DURRANT, seconded by Lord ROTHSCHILD.

CHAP. XX. *Annual Meeting.*

1. The Annual Meeting of the Society shall be held on the third Wednesday in January.

2. The objects of the Meeting shall be to receive from the Council, and hear read, their Annual Report on the general concerns of the Society; and to elect the Council and Officers for the ensuing year.

Proposal.—After Section 1, insert new Section 2 as follows:

"Notice of the Annual Meeting shall be sent to every Fellow whose last known residence shall be in the United Kingdom, at least seven days before such Meeting shall take place."

To present Section 2, after the word "Society" in the 3rd line, add the words:

To receive from the Treasurer, and hear read, his report, and the Statement of the Society's financial affairs.

The first proposal was adopted on the motion of Dr. Gahan, seconded by Mr. Donisthorpe, the second on that of Lieut. Ashby, seconded by Mr. Kaye.

The Rev. G. Wheeler said that the alterations in the Bye-laws would necessitate changes in the numbers of several Chapters and sections, and asked (in case it should be thought necessary) for authorisation to make such changes, which was accorded.

The Treasurer said there was still one amendment needed, as on removal to other premises it would be necessary for the Society to avail itself of the Statute relieving Literary and Scientific Societies from rates and taxes; one of the two necessary conditions was provided for in the present Chapter XXIII, but it was not definitely stated in the Bye-laws that the Society was exclusively a Scientific one; he therefore thought it would be well that the 1st Chapter should read :—

Chap. I. *Object.*

The Entomological Society of London is a Scientific Society instituted for the improvement and diffusion of Entomological Science exclusively.

It was proposed by Mr. Bethune-Baker, seconded by Dr. Cameron, and carried that this alteration be adopted.

Lord Rothschild then proposed and Mr. Lloyd seconded a motion that the Bye-laws as now amended be adopted, which was carried.

Ordinary Meeting.

Election of Fellows.

Mons. F. le Cerf, Curator of the Lepidoptera in the Paris Museum, 13, rue Guy de la Brosse, Paris; Miss Alice Ellen Prout, Lane End, Hambledon, Surrey; and Messrs. W. H. Tams, 8, Whitla Road, Manor Park, E. 12, and Alfred E. Tonge, Ashville, Trafford Road, Alderley Edge, Cheshire, were elected Fellows of the Society.

Exhibitions.

Zygaenas of the transalpina group.—Lord Rothschild exhibited a long series of Zygaenas of the *transalpina* group together with a series of *Z. ephialtes* showing parallel variation, and Mr. Bethune-Baker in illustration exhibited with the epidiascope a number of slides showing the differences in the genital armature of the various species.

The exhibitors contributed the following "Preliminary notes towards a revision of the *transalpina* group of the genus *Zygaena*."

In February last the junior author [Lord Rothschild] undertook to exhibit a series of forms of *Z. transalpina*, Esp., and a series of *Z. ephialtes*, L., to illustrate the curious parallel variation. However, on going into the question it was found that there were several species mixed up under the name of *transalpina*. We therefore thought it advisable, at the same time as the exhibit was made, to give a preliminary account of the several species, and at least point out their specific distinctions. The various species, races and aberrations hitherto referred to *transalpina*, Esp., have been reviewed most exhaustively by Monsieur Oberthür, Count Turati, Dr. Verity, Herr Dziurzynski and Signor Rocci, but we have failed to find anything upon the genital armature. We therefore thought it advisable to show on the screen a series of slides of the genitalia of the various insects hitherto united under *transalpina*, and also a few other species for comparison.

As Esper described his *transalpina* from Italy it is advisable to take the Italian forms first. Contrary to the opinion of Count Turati and Dr. Verity, the genital armature shows that we have two distinct species, confused under *transalpina*, inhabiting Italy. The one is a larger, more robust species, while the other is more slender and smaller; in many parts of Italy these occur together.

Esper described his *transalpina* from Verona, and of the series exhibited the four from Florence agree most closely with his description and figure. The larger, more robust species raised some difficult questions as to nomenclature. The two oldest names given to a form of this species are

boisduvalii and *xanthographa*. Almost unanimously entomologists have quoted Costa as the author of the name *boisduvalii*, which would have made this the correct name for the species by the law of priority. On looking this up, however, we found that no such name was given by Costa, who, in his "Fauna del Regno di Napoli," vol. v, p. 14, describes a black and yellow *Zygaena* under the heading of "No. 11, Z. della stecade, *Z. stoechadis*, *var.* n." The name *boisduvalii* was first given to Costa's description by Heydenreich in his "Lepidopterorum Europaeorum Catalogus Methodicus Systematisches Verzeichniss der Europaeischen Schmetterlinge," 1843, and therefore must stand as *boisduvalii*, Heydenr., NOT Costa as it is always quoted.

Dziurzynski in 1908 gives *boisduvalii* as the form with five spots, while *xanthographa* is given as having six spots. Germar in his description of *xanthographa* distinctly states that it has five spots, therefore as *xanthographa* Germar dates from 1837–38, while *boisduvalii*, Heydenr., dates from 1843, *boisduvalii* is a pure synonym of *xanthographa*.

So far as we have studied these insects, we can record five subspecies of *xanthographa*, viz. *xanthographa xanthographa*, Germ.; *xanthographa maritima*, Oberth.; *xanthographa pseudomaritima*, Turati; *xanthographa transiens*, Rocci, and a new form from Moulinet, Switzerland, *xanthographa helvetica*, subsp. nov., which I here diagnose.

Zygaena xanthographa helvetica, subsp. nov., differs from *x. maritima* in the much smaller red spots on the fore-wing and dark blue ground-colour, narrower black border to hind-wing, and large size.

Habitat, Moulinet, Switzerland.

Of *transalpina*, Esp., so far we can with certainty distinguish two subspecies: *transalpina transalpina*, Esp., and *transalpina altitudinaria*, Turati, and most likely a third can be recognised as *transalpina latina*, Vrty.

Whether when we have concluded our final study of this group it will be possible to separate further local races of *xanthographa* and *transalpina*, or if the enormous mass of further names given to these two species by Count Turati, Dr. Verity, Signor Rocci, and M. Oberthür only represent indi-

vidual aberrations cannot at present be decided. North of the Italian peninsula are certainly found three species, and probably the Pyrenaean and Basses Alpes form, hitherto united with *alpina*, will prove to be a fourth.

Zygaena alpina, Bcrce, is confined to the Alps proper, Savoy and the Pyrences (if the latter proves distinct, *alpina* would be restricted to the Alps and Savoy).

Zygaena astragali, Bkh. = *hippocrepedis*, Hbn., is the Central European species of the *transalpina* group and is found in Germany, Austria, Belgium, Holland, etc. Borkhausen's name dates from 1793, and so has twelve years priority over Hübner's of 1805.

Zygaena centralis, Oberth., is the name that must stand for the French species, which so far can be divided into three subspecies as follows: *centralis centralis*, Oberth.; *centralis occidentalis*, Oberth.; and *centralis provincialis*, Oberth. We have too little material from Central Europe to find out whether there are more subspecies than one treated of under *astragali*, but there is little doubt that there are several.

We hope later to publish a complete revision of this group of Zygaenae founded on the characters of the genitalia, but we thought these notes ought to be made public as soon as possible.

Appended are the senior author's notes on the genitalia.

Zygaena taurica, Dz., is a distinct species and not a race of any of the preceding ones.

Notes on the Genital Armature.

In the genitalia of the *Zygaenidae* the form of the tegumen and the armature of the aedoeagus are perhaps the most important characters, they are certainly the characters where the differences are most easily seen; there are, however, minor distinctions in the harpagines or clasps, but as these organs are generally large and broad the difference in shape is not so readily seen.

Z. filipendulae, L., Pl. A, fig. 1, has the tegumen extended into two long narrow digitate sclerites, the armature of the aedoeagus is mostly confined to the upper part of the sheath, and consists of a row of long, strong, tusk-like dentitions, with

a close-set smaller series of dentate projections becoming mere shagreening in the rear; the harpagines are very large.

Z. filipendulae manni, H.-S. Pl. A, fig. 2. The genitalia of this high alpine race show at once its very close relationship to Linné's species, the organs are not quite so large, but are otherwise similar.

Z. stoechadis, Bkh. Pl. A, fig. 3. These organs also prove its near relationship to *filipendulae* ; the harpagines are, however, smaller and the armature less formidable, whilst the armature is more extensive on the lower margin of the sheath.

Z. ephialtes, L., Pl. A, fig. 4 (ab *peucedani*, Esp., examd.), has the tegumen barely half the length of *filipendulae* ; the bifurcate sclerites are also much broader; the armature has long fine teeth and is closely beset with smaller dentition; the harpagines are also different in shape.

Z. lonicerae, Sch. Pl. B, fig. 5. The tegumen is shortly bifurcate; the armature has the dentition shortish, but the close-set area is very extensive; the harpagines are large and broadly oval.

Z. trifolii, Esp., Pl. B, fig. 6, has quite different harpagines; the armature has long, strong teeth, and is decidedly less extensive.

Z. angelicae, O. Pl. B, fig. 7. This is quite a distinct species from any of the preceding ones, and is allied to the *transalpina* group; the tegumen is bifurcate with irregular broad sclerites; the armature extensive, with very large tusk-like teeth on both upper and lower portions, whilst the clasps are narrower.

Z. centralis, Oberth., Pl. B, fig. 8, is allied to *angelicae* ; the bifurcate tegumen is longer and slightly humped; the armature with smaller dentition, and the harpagines different in shape, being squarer.

Z. astragali, Bkh., Pl. C, fig. 9, is a very close ally of *centralis* and *angelicae*; the tegumen is different, with a marked hump, it is broad and lobe-shaped; the armature is similar, with largish teeth; whilst the clasps are larger and oval.

Z. alpina, Berce, Pl. C, fig. 10, has the tegumen with longer bifurcation, and the shape of the digitate sclerites differs; the armature is extensive, with two rows of strong teeth; the clasps are broad, hairy and different in shape.

Z. xanthographa, Germ., Pl. C, fig. 11 (*x. maritima* examd.), is not the same species, I believe, as *alpina*; the bifurcate tegumen has the sclerites decidedly broader and bolder; the armature is very similar, but the harpagines decidedly narrow and different in shape.

Z. transiens, Rocci, Pl. C, fig. 12, D, 13 is evidently a form of *xanthographa*, with its narrow harpagines and longer bifurcation of the tegumen.

Z. transalpina, Esp., Pl. D, fig. 14, is certainly a different species; it has the tegumen shortly bifurcate with broad sclerites; the armature has quite small teeth with peculiar shagreening that is rather extensive; but the armature on the lower margin of the penis sheath is much reduced and finer, and the harpagines shorter and squarer.

Z. latina, Vrty., Pl. D, figs. 15, 16, is evidently a race of *transalpina*, all the organs being similar.

Z. alpina and *transiens* on one slide, showing the differences mentioned.

alpina and *transalpina* on one slide, showing the differences mentioned.

transiens and *latina*, yellow form, showing the differences mentioned.

Z. filipendulae, ♂ and ♀, in cop., showing the position of the various organs.

The following specimens and slides were exhibited :—

Zygaena transalpina, Esp., 171 specimens including the subspecies *altitudinaria*, Trti, and the named aberrations *hexamaculata*, Trti, *rhodomelas*, Trti, and *flava*, Vrty.

Z. xanthographa, Germ., 130 specimens including the subspecies *maritima*, Obth., *pseudomaritima*, Trti, and *helvetica*, B.-Baker and Rothsch., and the named aberrations *zickerti*, Hoffm., *diffusa*, Rothsch., *sexmaculata*, Dz., *sorrentina*, Stdgr., *sexmacula*, Dz., *calabrica*, Colb., *trimacula*, Obth., *depuncta*, Trti, and *pseudosorrentina*, Trti.

Z. taurica, Dz., 9 specimens.

Z. centralis, Obth., 70 specimens including the subspecies *occidentalis*, Obth., and *provincialis*, Obth., and the named aberrations *miltosa*, Caud., and *cingulata*, Hirschke.

Explanation of Plates.

PLATE A.

No. 1. *Zygaena filipendula*, from Isle of Wight (β708).
2. ,, *v. manni*, from Pontresina (303).
3. ,, *stoechadis*, from Central Italy (β704).
4. ,, *peucedani*, from Brussa, Asia Minor (296).

PLATE B.

No. 5. *Zygaena lonicerae*, from Macugnagua (987).
6. ,, *trifolii*, from Devonshire (β701).
7. ,, *angelicae*, from Austria (β710).
8. ,, *centralis*, from Mende Causse, France (368).

PLATE C.

No. 9. *Zygaena astragali*, from Jena (370).
10. ,, *alpina* (*transalpina Auct.*), from Tyrol (291).
11. ,, *xanthographa maritima*, from Italy (388).
12. ,, *xanthographa transiens*, from Italy (265).

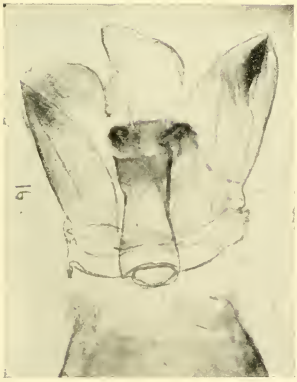
PLATE D.

No. 13. *Zygaena xanthographa transiens*, vertical position, from Italy (260).
14 ,, *transalpina altitudinaria*, from Italy (259).
15. ,, *transalpina latina*, from Italy (239).
16. ,, *transalpina latina*, vertical position, from Italy (235).

GENITALIA OF ZYGAENIDÆ.

GENITALIA OF ZYGAENID.E.

GENITALIA OF ZYGAENIDÆ.



GENITALIA OF ZYGAENIDÆ.

Z. astragali, Bkh., 22 specimens including the named aberrations *flava*, Kaufm., and *flaveola*, Kaufm.

Z. alpina, Berce, 80 specimens.

Slides of Genitalia :—*Z. filipendulae*, L.; *Z. filipendulae manni*, H.-S.; *Z. stoechadis*, Bkh.; *Z. ephialtes*, L., ab *peucedani*, Esp.; *Z. lonicerae*, Sch.; *Z. trifolii*, Esp.; *Z. angelicae*, Ochs.; *Z. centralis*, Obth.; *Z. alpina*, Berce; *Z. xanthographa maritima*, Obth.; *Z. xanthographa transiens*, Rocci; *Z. transalpina*, Esp.; *Z. transalpina latina*, Vrty.; *Z. alpina* and *transiens* on one slide; *Z. transalpina* and *alpina* on one slide; *Z. transiens* and *latina flava* on one slide; *Z. filipendulae*, ♂♀, in copulation, to show the position of the various organs.

A method of collecting and storing Insects, etc., fixed to leaves, without pressure.—Mr. C. B. Williams showed the following method :—

A small round shallow pill-box, with or without a glass lid, is taken and the inner cardboard ring separated from the rest of the box. For collecting the lid of the box with this inner ring in it is placed over the specimen on the leaf and the rest of the box beneath. On pressing the two halves of the box together the leaf with the specimen on it is pressed to the bottom of the box, where it is protected and kept in position by the cardboard ring, which is pushed back into its original position.

New and little-known Australian Insects.—Mr. Deuquet, who was present as a visitor, exhibited a number of Australian insects of various orders, many of which were still undescribed and unnamed.

Wednesday, June 2nd, 1920.

Comm. J. J. Walker, M.A., R.N., F.L.S., President, in the Chair.

Election of a Fellow.

Engineer-Commander S. T. Stidstow, R.N., H.M.S. Douglas, South Queensferry, was elected a Fellow of the Society.

Death of a Fellow.

The death was announced of Dr. Leonard Doncaster, a distinguished Fellow of the Society.

Exhibitions.

A case of parthenogenesis in Lasiocampa quercus, L.—Lord Rothschild exhibited 43 specimens of *Lasiocampa quercus*, of which he gave the following account :—

In 1919 Dr. K. Jordan collected at Hartland Quay, Devonshire, two or three larvae, from one of which the ♀ was hatched which was exhibited to-night with 42 of her offspring. This ♀ laid 193 eggs, from which some 150 larvae hatched, although no ♂♂ had been near the ♀ and no copulation could have taken place, as the cocoon was a solitary one in the breeding-cage. Of these 150 larvae some 75 were sleeved out of doors at Ashton Wold, and the rest were placed, with ivy as food, in a hothouse at Tring. All the sleeved larvae died; but from the hothouse-reared batch 56 cocoons were obtained, from which 43 specimens had so far emerged. Of these, one of two ♀♀, which emerged on 23rd of April, 1920, laid a number of eggs, which unfortunately were not counted; but from these there are now feeding 32 larvae, again on ivy in the hothouse. This ♀ was also unfertilised, so that we have here an extreme case of parthenogenesis persisting through two generations.

The parent ♀ and the offspring were exhibited on behalf of his niece, Miss Miriam Rothschild.

Mr. P. A. Buxton inquired what was the proportion of the sexes in the original brood, and Lord Rothschild replied that out of 43 specimens 14 were females. The President, Dr. Gahan and Mr. C. B. Williams gave instances of cases of parthenogenesis in Bombycid and Arctiid moths, but no instance was known of its persistence in a second generation.

Interesting Insects from New Zealand & Australia.—Dr. R. J. Tillyard exhibited two dead larvae of *Sabatinca barbarica* from New Zealand, one about half grown, the other full fed. The latter was brought alive from New Zealand in a

jar of moss, but succumbed to the heat of the tropics. He also showed two slides of microscopical preparations from a third larva, including the mouth-parts, antennae and armature of the cuticle. Dr. Tillyard also exhibited a gigantic undescribed species of *Heterojapyx* from Sydney, specimens of which have been found more than two inches long when alive. A dissection of this insect revealed the interesting fact that vestiges of the Malpighian tubules are present in the form of a circlet of six small evaginations of the anterior end of the hind-gut. A further exhibit was a set of tubes showing the eggs, larvae, pupae and imagines of the remarkable Australian Moth-lacewing, *Ithone fusca*. The eggs are laid in the sand and hatch out into little white melolonthoid-like grubs, which burrow downward and attack the larvae of *Scarabaeidae*. The mouth-parts are very small, but of the true planipennian sucking type; the head is reduced, eyes absent, and the fore-legs formed for burrowing. The larva gives out a delightful scent of lemon essence. The pupa is enclosed in a cylindrical cocoon with rounded ends, formed of a white papery substance, like that made by some Hymenoptera. The imago superficially resembles a Hepialid moth. It flies only at sunset, the males assembling in dozens round the females on tree-trunks.

Examples of Gynandromorphism in Lepidoptera.—Mr. Talbot, on behalf of Mr. J. J. Joicey, exhibited the following Gynandromorphs :—

Papilio castor, Westw.—The left side is female. The right side is a mixture of both sexes.

Teracolus pleione, Klug.—A specimen taken at Aden, from the collection of Lieut.-Col. Nurse. Left side male, right side female, with patches of orange on hind-wing.

Delias descombesi leucacantha, Fruh.—A specimen from Sikkim from the collection of H. J. Elwes. Left side male, right side female.

Amorpha populi.—Two specimens received from the firm of Staudinger and Bang-Haas. One specimen with the right side male, and left side female, with left hind-wing partly male. Second specimen with right side male, left side female with apparently an admixture of male elements.

Dendrolimus pini.—Seven specimens received from the

firm of Staudinger and Bang-Haas. The following information was furnished us by Herr Bang-Haas :—

The species was met with in 1918 as a very noxious pest which destroyed a large part of the fir woods in Pommern and Brandenburg. All the country and school children were engaged in destroying the moth. A careful examination was made of 100,000 specimens, with the result that seven gynandromorphs were found. Specimens 1 and 2 have right side male and left side female. No. 3 has right side female and left side male. No. 4 has right side with male antenna, fore-wing female, hind-wing mostly male; left side with female antenna, wings male. No. 5 has right antenna female, left antenna male, and wings female. No. 6 has both antennae male, right fore-wing male, right hind-wing mostly female; left wings female. No. 7 has right side male; left antennae with reduced pectinations, left wings female. We note that eight fore-wings are female, and six are male; seven hind-wings are female, two are intermediate, and five are male. A full account with figures of these gynandromorphs will be published later.

New and rare Lepidoptera.—Mr. Talbot also exhibited the following species :—

A pair of the very rare alpine species *Eriogaster arbusculae*, Frr., bred by Herr Standfuss from larvae obtained in the Upper Engadine at 1800 metres. In 1912 10,000 larvae were reared, but out of these only 20 ♂♂ and 10 ♀♀ could be obtained. A full account of the life-history has been given by Standfuss in the " Mitteilungen der Entomologia," Zurich, 1916.

Papilio levassori, Ob.—Described in 1890 from a single specimen. Two others exist in the Paris Museum. This remarkable species belongs to the *leonidas* and *brasidas* group according to a study of the genitalia made by Monsieur F. Le Cerf of the Paris Museum. It is wrongly placed by Aurivillius in the *ucalegon* group. The species is only known from the Great Comoro Island.

Salamis augustina, Bbv.—A male specimen from Reunion Island. Also occurs in Madagascar. A male specimen from Mauritius formerly in the collection of the late Roland Trimen.

This specimen represents an undescribed race. Only one other individual has been preserved and exists in the Port Louis Museum. The form is evidently now extinct. An interesting discussion of this species by the late Colonel Manders appeared in the Trans. of the Society for 1907.

Acraea, sp. nov., from the district of Lake Kivu, Central Africa, taken by Mr. T. A. Barns. Belongs to the *sotikensis* group.

Callioratis abraxas, Feld.—A new race from Nyassaland. The typical form is very rare and inhabits S. Africa.

Papilio euterpinus, G. & S.—A specimen of the female. Only one other is known to exist in collections, and that also is contained in Mr. Joicey's collection, having been received with the Grose-Smith collection, and referred to in "The Revision of S. American Papilios," by Rothschild and Jordan.

Eunica chlorochroa, Salv.—Three aberrations of this species from S. Peru. Aberrations of this genus are rare, being even more common in *Catagramma*. The aberrations exhibited are of the underside only and represent an increase of the black markings.

The Weaver-bird observed eating butterflies by W. A. Lamborn.—Prof. Poulton said that he had now received, forwarded from Kuala Lumpur, F.M.S., the bird seen to catch and eat the Pierine *Catopsilia florella*, as described in Proc. Ent. Soc., 1920, p. xxvi. The specimen, exhibited to the meeting, had been kindly named for him by Mr. Charles Chubb of the Ornithological Department of the Natural History Museum. It was *Hyphantornis nigriceps*, Layard, one of the Weaver-birds (*Ploceidae*).

Dr. H. Eltringham stated that he had made an examination of the contents of the tubes containing material from the stomach and intestines of the bird taken by Mr. Lamborn and dated 10.12.19. In both the material was in a fine state of maceration. A small portion of the mass examined with a $\frac{1}{2}$in. objective showed many traces of butterfly remains. Fragments of the proboscis and of the corneal layer of the eye were easily observed, whilst it was difficult to move the slide into any position in which there were not one or more lepidopterous scales to be seen in the field. He had consulted with Dr.

F. A. Dixey as to whether it would be possible definitely to recognise scales of *Catopsilia florella*, but unfortunately the scales of this butterfly are not very distinctive. The examination showed how rapidly all ordinarily visible traces of lepidopterous remains are obliterated by the digestive processes of the bird, and how useless would be the investigation of the contents of birds' stomachs except by careful observation under the compound microscope. He had also examined some faeces of a wagtail dated 16.12.19, but had not found traces of Lepidoptera in same.

The recent date of the invasion of Madagascar by Hypolimnas bolina, L.—Prof. Poulton said that a few weeks ago he had received the following message from M. Charles Oberthür, whose vast experience of Malagasy butterflies made the negative evidence unusually valuable. By a curious coincidence M. René Oberthür received an example of the species on the very day when the question was asked and answered.

"*May* 16, 1920. *Rennes.*

" My brother has received the Indian form of *Hypolimnas bolina*, to day, from Vangaindrano, in the southern part of Madagascar. I have not hitherto received the Indian form from this island."

It would be remembered that Archdeacon Kestell-Cornish, now Bishop of Madagascar, considered that *bolina* first appeared in 1912 or a little earlier (Proc. Ent. Soc., 1916, p. xxiii).

Papers.

The following papers were read:—

" Five years observations (1914–1918) on the bionomics of Southern Nigerian Insects, chiefly directed to the investigation of Lycaenid life-histories and the relations between Diptera and ants, by the late Charles Ogilvie Farquharson, M.A., B.Sc., Aberdeen." Edited, with a brief life of the author, by Edward B. Poulton, D.Sc., M.A., F.R.S., Hope Professor of Zoology in the University of Oxford, Fellow of Jesus College, Oxford. With a systematic and descriptive Appendix by R. S. Bagnall, G. T. Bethune-Baker, J. E. Collin, J. Hartley Durrant, F. W. Edwards, Dr. Harry

Eltringham, D.Sc., M.A., Dr. J. B. Gatenby, D.Phil., Prof. R. Newstead, F.R.S., Dr. J. Villeneuve, and Rev. J. Waterston.

In bringing forward the paper Prof. Poulton exhibited the whole of the Lycaenine butterflies belonging to *Argiolaus* and allied genera bred by Mr. Farquharson from larvae feeding on the flowers of *Loranthus*; also a number of bred *Lycaeninae* and *Lipteninae* with their respective pupa-cases, showing the wide difference between the two types of pupae. He also exhibited examples of the Diptera described in the Appendix by Mr. J. E. Collin and Mr. F. W. Edwards, and a series of the Asilid fly *Philodicus temerarius*, Walk., from Agege, near Lagos, with its very varied prey.

"A contribution to the knowledge of the Anthomyid Genera *Hammomyia* and *Hylephila* of Rondani (Diptera)," by J. E. Collin, F.E.S.

"Experiments on the relative edibility of Insects with special reference to their coloration," by G. D. Hale Carpenter, D.M., B.Ch., F.E.S.

Both these papers were illustrated by the epidiascope.

In answer to several inquiries Dr. Carpenter explained that the edibility of insects was always relative, and that positive inedibility was almost non-existent.

Wednesday, October 6th, 1920.

Comm. J. J. Walker, M.A., R.N., F.L.S., President, in the Chair.

Election of Fellows.

Messrs. A. M. Altson, 26, Addison Mansions, Blythe Road, West Kensington; Hubert Meredydd Morris, M.Sc., Institute of Plant Pathology, Rothamsted Experimental Station, Harpenden; Sydney Douglas-Crompton, Villa Helvetia, Costebelle, Hyerès, France; J. C. M. Gardner, Entomological Dept., Royal College of Science, S.W. 7; Bernard Sinclair Goodban, Braemar, Belvedere Road,

Upper Norwood, S.E. 19; Harry Hargreaves, Entomological Dept., Royal College of Science, S.W. 7; Charles McFarlane Inglis, M.B.O.U., F.Z.S., Baghownie Factory, Laheria Sarai, Bihar, India; Douglas Johnstone, Brooklands, Rayleigh, Essex; Capt. Arthur Leslie Kent-Lemon, York and Lancaster Regt., c/o Postmaster, Khartoum, Sudan, and Blytheswood, Ascot, Berks; Messrs. W. H. J. Prior, Culham, Main Road, New Eltham, Kent; Philip Bernard Richards, Agricultural Dept., Kuala Lumpur, Federated Malay States, and 52, Longridge Road, Earl's Court, S.W. 5; Lieut. J. Seabrook, Fern Bank, Bakewell, Derbyshire; and Mr. John William Spencer, 5, Dogford Road, Rayton, Oldham, Lancs., were elected Fellows of the Society.

The Society's New Quarters.

The Treasurer gave an account of the present position of the negociations for new quarters for the Society, saying that No. 41, Queen's Gate was now almost certainly secured; the cost of the Freehold, re-decorating and furnishing would be about £9000, towards which a considerable sum in donations and loans had already been promised. He urged upon the Fellows the duty of supporting this project. The President, the Rev. F. D. Morice and Mr. Bethune-Baker also spoke in support of the scheme. Mr. Rowland-Brown suggested approaching the Dept. of Agriculture with a view to obtaining assistance, and also proposed a vote of thanks to Mr. Sheldon and the sub-committee, which was seconded by Dr. Cockayne and carried unanimously.

Exhibits.

Ornithoptera rubianus.—Mr. A. Dicksee exhibited 5 males of *O. rubianus* from Ronongo, the westernmost of the Solomon Islands, two specimens only being previously known; he pointed out that no two specimens were alike; they were taken in January and February.

Mermithogynes of Acanthomyops (Donisthorpea) niger, and an Earwig with rudimentary Forceps.—Mr. Donisthorpe exhibited a number of mermithogynes of *Acanthomyops* (*Donisthorpea*) *niger*, L., taken in a populous nest of this ant

situated under a large flat stone near a small stream running into the sea at Mother Ivey's Bay, N. Cornwall, on July 7th, 1920. Also a number of the worms extracted from the gaster of the ants. One or two worms occurred in each ant. Nearly all of the mermithogynes possessed a curious hole in the thorax, a point not found before, the object of which was obscure. Numerous normal-winged females as well as mermithogynes occurred in the nest. The whole nest was carefully dug up and the colony brought home.

He mentioned that it was the first time he had personally taken these short-winged females, but that his colleague, Mr. Crawley, had done so on several occasions, and was working at a paper on the subject; Mr. Donisthorpe had therefore presented the nest to him.

Mr. Donisthorpe further exhibited a live specimen of the common Earwig (*Forficula auricularia*) taken near Wellington College on Sept. 13th last, the forceps of which were practically absent, being represented by the merest rudiments. He suggested that their absence was probably caused by the presence of some internal parasite.

Dr. Imms and Mr. F. W. Edwards commented on this exhibit, and Mr. Donisthorpe, in replying, observed that the worker ants when attacked by this parasite became larger and developed some female characters.

Heterocera and Diptera chiefly from N. Italy.—Lieut. Ashby exhibited a number of moths taken during the summers of 1918 and 1919 in the districts of Vicenza, Arquata Scrivia, and Turin; also a few from France, including *Lignicolor furvata* from St. Martin Vésubie, and from La Granja, Spain.

He also exhibited the following Diptera from the above Italian localities. *Volucella zonaria, V. pellucens, V. inflata, V. inanis, Eristalis arbustorum, E. aenea, E. tenax, Ocyptera brassicaria, Leptis tringaria, L. scolopacea, Tipula maxima, Myriatropa florea, Pharia crassipennis, Sphacrophoria dispar, Chrysotoxum maculatum, C. italicum, C. elegans, Milesia crabroniformis, Laphira maroccana, Echinomyia grosso, Bombylius medius, Brachypalpus vulgus, Catabomba pyrastri, Tabanus ater, Dasypogon teutonus, Sarcophaga carnaria Xanthogramma citrofasciatum, Calliphora vomitoria.*

Butterflies from Mesopotamia.—The Secretary read the following letter :—

"26 *Dec.* 1919,
" (Mosul).

" Dear Sir,

" With reference to ' The Poverty of the Butterfly Fauna of Mesopotamia ' in a recent number of the Society's Transactions in which Prof. Poulton quotes a letter from Capt. P. A. Buxton, R.A.M.C., giving about 9 species as the total so far met with by that officer in Mesopotamia, it might interest you to mention that although this is probably about the number of species to be found at Amara (I saw a male *Ixias pyrene* close to me at some flowers there), many more species are to be found above Baghdad, about the low hills or ' jebels ' near the Persian and Kurdistan borders; and I am acquainted with at least 42 species of Mesopotamia, having myself taken 31 of these species there, apart from some 14 more in N. Persia.

" Yours, etc.,
" H. D. Peile
" (Lt.-Col., I.M.S.)."

Paper.

The following paper was read :—

" The full-grown Larva of *Lycaena euphemus*, Hb.," by T. A. Chapman, M.D., F.R.S., etc.

Wednesday, October 20th, 1920.

Mr. W. G. Sheldon, F.Z.S., Vice-President, in the Chair.

Election of Fellows.

Dr. F. G. Rambousek, vii/1169 Prague, Czecko-Slovakia; Messrs. William F. Schlupp, B.Sc., The School of Agriculture and Experiment Station, Potchefstroom, Transvaal; George Harold Skaife, M.A., Agricultural College, Cedara, Natal, S. Africa; and Robert Owen Wahl, B.A., Groot Fontein

School of Agriculture, Middelburg, Cape Province, S. Africa, were elected Fellows of the Society.

The New House.

The Chairman, as Treasurer, made a further statement as to the new house and mentioned that the cost of the Freehold was £6250.

Exhibitions.

Aberration of Brenthis selene.—Mr. E. E. Green exhibited an interesting aberration of *B. selene*, taken at Camberley on the 24th of June last. The aberrant characters are more conspicuous on the underside of the wings. The spot at the base of the fore-wing is missing, and the markings on the outer border are diffused. On the hind-wing the ground-colour is silvery white, with a faint greenish tinge, while the usual red markings are largely replaced by a suffusion of black scaling. The upper surface has the black pattern on the hind-wing diffused, with the spots more or less confluent, those of the median series being united to form a continuous transverse band.

Butterflies (Delias : Pierinae) migrating in evening from one valley to another in Selangor, F.M.S., and back in morning, accompanied by moth mimics (Dysphania (Euschema) Geometrinae), and these again by their moth mimics (Psaphis : Chalcosiinae : Zygaenidae).—Prof. Poulton exhibited the following Lepidoptera from Bukit Kutu, in Selangor, close to the borders of Pahang, about 35 miles N.N.E. of Kuala Lumpur—a part of the collection made by Mr. A. R. Sanderson, as described in his letter printed on p. lxv.

Delias ninus, Wall.,—3 ♂.

Delias pyramus, Wall.,—2 ♂ 1 ♀.

Dysphania (*Euschema*) *glaucescens*, Walk. (*regalis*, Butl.),—1 ♂ 2 ♀.

Dysphania (*Euschema*) *militaris*, L., f. *selangora*, Swinh.,—1 ♂.

Psaphis (*Canerkes*) *camadeva*, Dbl. (*semiplena*, Walk.; *resumpter*, Walk.)—1 ♂.

There could be no doubt that, as Mr. Sanderson states, all the species would resemble each other upon the wing; for the deep red of the *Delias* would then be the least conspicuous element in its pattern, while the general distribution of the black and blue-grey on all wings and yellow upon the hind, is similar in the Pierines and Geometers, the resemblance being heightened during flight by the likeness between the patterns of upper and under surface. In the male Chalcosiine mimic, however, the resemblance depends almost entirely upon the under surface where alone is developed the essential feature contributed by the yellow. The female *Psaphis camadeva*, with the yellow markings strongly developed on both surfaces, was very similar to *Canerkes scotais*, Jord., and the larger species, *C. euschemoides*, Moore, all three being close mimics of Dysphanias. *C. euschemoides*, from Assam and "India," resembled *D. excubitor*, Moore, and the Indian form of *D. militaris*, L.; *C. scotais*, Jord., from Borneo—*D. subrepleta*, Walk.; the female of *P. camadeva* in Malacca, Borneo and probably in Java—*D. subrepleta*, and in the Philippine Islands—the allied *D. plena*, Walk.*

Although during flight, the female *P. camadeva* would resemble *D. glaucescens* and, far more closely, *D. militaris*, it was probable that the better model *D. subrepleta* and perhaps other Dysphanias would be found to accompany the *Delias* in their migratory flights in Selangor.

The existence of any significant likeness between these Geometers and *Delias* had never been hinted at before, and it was especially interesting that its recognition had been preceded and indeed suggested by the observation of associated habits and resemblance during life.

The combination was typically Müllerian, *Psaphis* belonging to a specially protected Family and Subfamily,† *Dysphania*

* The resemblance of these Chalcosiine mimics to *Dysphania* (*Euschema*) is well known, as the name *euschemoides* clearly shows. Erich Haase speaks of this species as a mimic of *Euschema militare*, L., and *C. semiplena*, viz. *Psaphis camadeva*, female, from Minahassa, of a *Euschema*, doubtless *D. plena*, from the same locality. ("Researches on Mimicry, etc.," Pt. II, English trans., Stuttgart, 1896, p. 38.)

† *Hampsonia pulcherrima*, Swinh., from the Khasia Hills, allied to *Psaphis* and *Canerkes* is apparently as extreme an instance of Warning Colours as any known among insects. The ground-colour is black with

acting as a model as well as mimic, *Delias* being well known as a model for other Pierines, for Elymniines, Nymphalines and Chalcosiine moths other than *Psaphis*.

The facts now brought forward were quite new to Mr. Prout and Dr. Dixey, and they were so extremely interesting that it was to be hoped that the whole of the material collected by Mr. Sanderson and Mr. Harvey would be available for examination and the publication of a complete list, showing the proportions of the various species. It was also of the highest interest to repeat the observation, keeping separate the evening and morning streams of migration so as to compare the proportions of their constituents; also to investigate the areas reached by the two streams in order to determine the causes at work.

The exact conditions under which the migrations took place were of the highest interest and importance and it was very fortunate that they had been accurately noted by the captor, as would appear from the following letter, written May 11, 1920, from the Research Laboratory, Petaling, F.M.S., to Mr. W. A. Lamborn, who had seen the specimens in Mr. Sanderson's collection and at once recognised the importance of the discovery :—

" The following data relating to the butterflies and moths you saw from Bukit Kutu may be of interest :—

" Altitude of old Government Bungalow 3457 ft.

" Period when insects taken 5th to 13th March, 1920.

" The butterflies and moths were noticed by Mr. T. R. Harvey and myself flying over the crest of the hill on which the old bungalow stands, first time March 4, 1920. The insects passed over from a deep valley about 5.30 p.m. to 6.45 p.m., sometimes two or three together at intervals of about one to two minutes and occasionally appearing in a more or less continuous straggling line for ten to twenty minutes. Generally a maximum number passed over in approximately

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large bright yellow spots on the fore-wings and brilliant red and yellow markings on the hind. Another glaringly aposematic Oriental Chalcosiine, is the well-known *Campylotes histrionicus*, Westw. The pattern of upper and under surface is similar in both these species, as it is commonly in the whole subfamily.

an easterly direction about 6 p.m. From that time onwards the numbers steadily decreased. Many swallows were usually circling round at the time, but I did not see any of the insects taken. As a rule the insects were never more than about 20 ft. above the surface of the ground when passing the crest.

" The phenomenon was repeated in the opposite direction in the early mornings, 6.30–8 a.m., the numbers being approximately the same, so far as I could judge. Mr. T. R. Harvey captured some of the specimens in a similar manner to mine, viz. by standing in the narrow part of the ridge and utilising opportunities when the insects flew low (5–8 ft.). Odd specimens of the butterflies were taken during the day-time between 10 a.m. and 2 p.m., but in no case was a moth captured between these hours.

" The flight was repeated every evening and every morning while I was at the bungalow except that on two evenings, which were very wet, only a very small number passed over. The fact that large numbers passed back next morning suggests, however, that the insects may have flown over later the previous evening. There was not sufficient difference in the mode of flight for me to distinguish moths from butterflies, and in fact I did not notice the difference clearly until getting back here."

Dr. Dixey made the following comments on *Delias* in the above communication :—

Of the six specimens of the Pierine genus *Delias* which are included among the insects received by Prof. Poulton as having formed part of the migratory flight observed at Bukit Kutu in Selangor, three (two males and a female) are *Delias pyramus*, Wall., and three (all males) are *Delias ninus*, Wall. These two forms of *Delias*, though closely allied, are quite distinct. The most obvious differences between the males are as follows :—

(1) In *D. pyramus* the yellow of the hind-wing upperside does not generally extend outwards further than to the 1st branch of the median vein; in *D. ninus* it always reaches at least as far as the 3rd median, and extends beyond this in the form of a slight yellow powdering usually as far as the 2nd branch of the subcostal.

(2) In *D. pyramus* the basal red of the hind-wing upperside is bounded by a well-defined dark band; in *D. ninus* the corresponding region of the wing is occupied by a broad patch of greyish-blue.

(3) In *D. pyramus* the marginal portion of the interspaces in the hind-wing upperside, external to the yellow patch, is occupied by a series of pale streaks; in *D. ninus* the corresponding area is almost uniformly dark.

The female of *D. ninus* was not described by Wallace, whose type is a male from Mount Ophir in Malacca; it is not mentioned by Fruhstorfer in Seitz's "Lepidoptera," and was unknown to Distant (*Rhopalocera Malayana*). The Adams Collection in the British Museum contains one specimen of the female, from Perak; and Dr. K. Jordan has kindly informed me that there are specimens of *D. ninus* ♀ in the Museum at Tring. The female in the Adams Collection is like the female of *D. pyramus* in having the red of the upper surface of the hind-wing bounded by a black band as in *D. pyramus*, not by a greyish-blue patch as in *D. ninus* ♂. On the other hand, the yellow of the hind-wing upperside is less suffused with dark scales than in *D. pyramus* ♀; and the outline of the fore-wing is rounded, not pointed as in both sexes of the latter insect.

D. ninus is so far as I am aware confined to the Malay Peninsula, though it has a representative in Sumatra and another in Borneo. I know of no example from further north than Penang. *D. pyramus*, on the other hand, is mainly a Himalayan butterfly; but its range extends to Burma, and there is a specimen in the British Museum from as far south as East Pegu. Mr. Distant does not include it in the text of his *Rhopalocera Malayana*, but inserts it in the Appendix to that work on the strength of an example captured by Egerton at Low's Hill in Perak. This was the most southerly record known to me until I saw the specimens now before us.* In view of what had hitherto been known of the respective habitats of these two species, it is somewhat surprising to

* It is worth noting that Von Mitis ("Iris," 1893, pp. 118, 119) describes a male specimen from Malacca which, though considered by Von Mitis to be a form of *ninus*, is in some respects transitional to *pyramus*.

find them taking part in the same flight, and at a point so far to the south of the usual range of *D. pyramus*.

* A curious confusion has arisen with regard to *D. ninus* and another related form, which I may be allowed to take this opportunity of noticing. Mr. Wallace's original description of *ninus* had associated with it the figure of another species, *D. parthenope*, while his description of *parthenope* was illustrated by figures of the upper and underside of *ninus* (Trans. Ent. Soc. Lond., 3rd series, IV, p. 347, Plate VI, figs. 5, 5*a*; Plate VII, fig. 1). This mistake, corrected by Von Mitis (Systematisches Verzeichniss der Arten des Genus Delias Hübn.; "Iris," 1893, pp. 100, 117–122), by Mr. Butler in his Revision of the genus (Ann. Mag. Nat. Hist., 1897, pp. 163, 165), and by Mr. J. C. Moulton (List of the Butterflies of Borneo, Part IV, Nos. 564, 566; Journal of Royal Asiatic Society, Straits Branch, No. 67, December 1914), is passed over by Fruhstorfer in Seitz's work, and had not been rectified at the date of Mr. Distant's *Rhopalocera Malayana* (1882–1886). The latter author accordingly gives under *parthenope* (p. 291, Tab. XXIV, fig. 4) a description and figure which are those of *ninus*; while under *ninus* he reproduces Wallace's description of *ninus*, together with Wallace's figure called by Wallace *ninus*, but really representing that author's *parthenope*, a form of the nearly allied *D. aglaia* Linn. I am indebted to Dr. Jordan for drawing my attention to the fact that the interchange of Wallace's figures was first detected by Von Mitis (*loc. cit.*).

The substance of the preceding paragraph may be summarised as follows :—

Wallace's description of *ninus* is *ninus*.
His figure of *ninus* is *parthenope*.
His description of *parthenope* is *parthenope*.
His figure of *parthenope* is *ninus*.
Distant's description and figure of *parthenope* are *ninus*.
His description of *ninus* (quoted from Wallace) is *ninus*.
His figure of *ninus* (reproduced from Wallace) is *parthenope*.

The colour of the larva of Smerinthus ocellatus, on wild crab.—Prof. Poulton said that during the past September he had had the opportunity of confirming his early

observation that the larva of *S. ocellatus*, when feeding on the crab, gains a shade of green entirely different from that produced by the ordinary cultivated apple. The latter with their white undersided leaves produce larvae of a bluish-green tint below, becoming very pale, almost dead white, but still very faintly tinged with bluish-green, above; while the crab leaves with green under surfaces produce bright yellowish-green larvae with a pale yellowish dorsal surface. It was the recognition of the difference between *ocellatus* caterpillars on Siberian crab and other apple trees in his father's garden at Reading nearly fifty years ago which had first directed his attention to the power of individual colour adjustment in larvae, and, also inspired by the late Prof. Meldola's notes in Weismann's "Studies in the Theory of Descent," had led him to observe and experiment largely upon the species (Trans. Ent. Soc. Lond., 1884, p. 35; 1885, pp. 305–307; Proc. Roy. Soc., Vol. xxxviii, 1885, pp. 298–308; Vol. xl, 1886, pp. 135–173).

The tabular statement of all the experiments and observations, printed in the last-quoted paper, shows on p. 167 that three larvae found on crab (two at Reading on Siberian crab, one in 1884 at Oxford on wild crab) were of the yellowish-green tint, but that five larvae fed from the egg on cultivated crab in 1884, and nine on wild crab in 1885, were all of the usual bluish-green tint produced by ordinary apple. On pp. 160–161 the attempt was made to explain these and other irregularities. At the same time further observations of crab-fed larvae in the field were much wanted, but, until the present year, had not been obtained.

During a recent visit to Willersey, in the Broadway district, on the borders of Worcestershire and Gloucestershire, the wild crab was found to be extremely plentiful as a hedge-row bush, bearing small leaves with a green under surface. In the opinion of Mr. G. C. Druce the form was *Pyrus malus* var. *paradisiaca*, De C., and he would now substitute this determination for the name var. *acerba*, L., quoted from him in some of the above-mentioned papers. The shoots were observed to be extensively eaten, evidently by large larvae, and, although most of them had disappeared, two *ocellatus* in the last stage were found on a small bush on September 13 and one on a

larger bush four days later. All were bright yellowish-green forms, confirming the scanty earlier observations.

So many shoots of the bush on which the single larvae was found (September 17) were stripped bare that many larvae must have been at work. It was a common experience that these and other Sphingid larvae, when reared in confinement and at all crowded, are apt to nibble each other's horns off, and the same was true of the caudal forks of *Cerura vinula*, and, according to the experience of Mr. A. H. Hamm and Mr. J. Collins, of the elongated true legs and occasionally the caudal processes of *Stauropus fagi*. But Prof. Poulton had never heard of these injuries being inflicted upon Sphingid larvae in the wild state. It was therefore interesting to find that the horn of the last-remaining *ocellatus* had been nibbled down to a stump, and the injury probably explained the protracted development of the larva, for the loss of blood caused by these injuries was often considerable. The comparison between the three larval skins, thrown off at pupation, and exhibited to the meeting, showed the extent of the injury very clearly.

The period intervening between the cessation of feeding and the throwing off of the larval skin varied from about six to nine days. All three larvae produced male pupae.

The Rev. G. Wheeler remarked that he had many years ago in Berkshire bred *S. ocellatus* from larvae found on crab, and that only knowing the yellow-green larvae he had supposed on first seeing an illustration of the more usual form that it was wrongly coloured!

Wednesday, November 3rd, 1920.

Comm. J. J. Walker, M.A., R.N., F.L.S., President, in the Chair.

Election of Fellows.

Messrs. Thomas Alexander Barns, F.Z.S., 32, Windsor Court, Bayswater, London, W.; George Bethell, F.R.Hist.S., 11, Chandos St., London, W.1; Major John Errol Moritz

Boyd, M.C., R.A.M.C., Pendavey, Birchington-on-Sea; Miss Mary Frances Cossart Brïdson, Ford Brow, Dartmouth; Messrs. Thomas Cockcroft, 111, Owen St., Wellington South, New Zealand; Ernest Crabbe, 52, Sarsfeld Road, Balham, S.W.12; J. W. Griffen, 27, The Summit, Liscard, Wallasey; Alister Clavering Hardy, 40, Harlow Moor Drive, Harrogate; Valentine Knight, Assistant Director Raffles Museum, Singapore; Russell James, 7, Broadlands Road, Highgate, N.6; George Lodge, Hawkhouse, Camberley; Hugh Kenneth Munro, B.Sc., 258, Bourke St., Pretoria, S. Africa; John Golding Myers, Aramoho, Wanganui, New Zealand; Alfred Philpott, Assistant Entomologist, Biological Dept., Cawthron Inst. of Scientific Research, Nelson, New Zealand; Arthur Walter Richardson, 28, Avenue Road, Southall, Middlesex; Dr. Winstan St. Andrew St. John, M.R.C.S., L.R.C.P., Derwent House, Derby; Dr. John W. Scharff, M.B., D.P.M., Tampin, Federated Malay States; Messrs. Joseph Tinsley, West of Scotland Agricultural College, Burns Avenue, Kilmarnock; and William Wallace, M.B., 15, Hainton Avenue, Grimsby, were elected Fellows of the Society.

Exhibitions.

New Butterflies from Dutch New Guinea.—Mr. G. Talbot exhibited on behalf of Mr. J. J. Joicey a number of New Butterflies from the Weyland Mountains, Dutch New Guinea.

The specimens shown formed part of the first collection made by the three brothers C., F., and J. Pratt, who were sent out by Mr. Joicey to explore a little-known part of New Guinea. The Pratts were successful in reaching the Weyland Mountains which lie about forty miles inland from the coast of Geelvink Bay.

New forms of the following species were shown:—*Troides chimaera* Roths., *Papilio albertici* Ob., *Morphopsis ula* Roths., and *Morphotaenaris schonbergi* Fruh. Also a distinct species of a *Delias* belonging to the *ligata* group, a striking *Morphopsis*, a *Hypocysta*, a *Harsiësis*, and a species of a new genus closely allied to *Hypochrysops*.

Specimens of *Troides joiceyi* J. and N., were shown to illustrate the transition from the typical form with black lateral abdominal sclerites, and the form without any such black scaling. These forms were taken at the same place. The *Morphotaenaris* connects *schonbergi* from Stephansort with *kenricki* from the Arfak.

The *Morphopsis* inhabits the dark forest at 5000 ft., and flies at dusk. Descriptions of these new forms will be published in due course.

Lepidoptera from the Cook and Society Islands; including an analysis of the markings of the females of Hypolimnas bolina, L.—Prof. Poulton exhibited specimens illustrating the following extracts from letters received from Mr. H. W. Simmonds of the Department of Agriculture, Suva, Fiji :—

"*April* 19, 1920. *Tahiti, Society Islands.*

"As to the Tahitian butterflies, *H. bolina* is most abundant, but apparently all males. There seem to be hundreds of males to one female. I say 'seem to be' because the two (now four) females I have taken are almost like the ♂, and, as all are worn, I may pass them by.

"Everything here is, so far as I have seen, Polynesian-New Guinea in its origin, except probably some of the Hymenoptera which seem more numerous in individuals and species than in Fiji. Possibly some of the beetles also may be New World, but I have only seen five species, and two of these are akin to New Zealand forms. There is no native bush left in valley or hill, up to 2000 ft. or more, in this district, and hardly any tracks. I hope to reach the forest before I leave, but as yet have only seen about four indigenous trees. The country is all *Lantana*. The trees are : *Metrosideros* (or very close to it), a New Zealand type; *Hibiscus*, identical with a Fijian species; two Timber trees, very close to Fijian species."

"*August* 9, 1920. *Suva, Fiji.*

"I have just got back to Suva and hope to send you a few specimens by this mail from Rarotonga, Manjaia and Aitutaki in the Cook Is., and Tahiti in the Society group. I did

not see or hear of the *Euploea* in the Cook group. I saw *D. archippus* in Aitutaki only. The little blue *C. cnejus* (or form) was present in all the Cooks but not in Tahiti. I did not meet *M. leda* in the Cooks, but it was present in Tahiti. The *Atella* was present in Rarotonga and Manjaia, but I did not see it elsewhere.

" The Tahitians are all wretched specimens, but I saw no decent Euploeas and, so far as *H. bolina* is concerned, although I saw hundreds of ♂, I only saw four or five ♀ in Tahiti, and all resembled the ♂. The form from Rarotonga is very distinct, being larger and always with the buff apex to the fore-wings, although often variable in the rest of the pattern. This is a most interesting species in the various groups of islands."

The nine Euploeas from Tahiti were the *walkeri*, H. H. Druce, form of *Nipara eleutho*, Quoy—a very uniform series, similar to that captured by the President in 1884. Although no Euploeas were to be seen in Rarotonga when Mr. Simmonds visited it, a different, more variable, and often much darker form of *N. eleutho* was taken there by Commander Walker. On the other hand Mr. Simmonds had sent eleven ♂ and seven ♀ of *Issoria* (*Atella*) *egista*, Cr., f. *bowdenia*, Butl., from Rarotonga (May, June, 1920)—a species Commander Walker had seen but failed to catch. The commonest Lycaenid captured by Mr. Simmonds in the Cook Islands was *Jamides carissima*, Butl.: from Manjaia two *Zizera labradus*, Godt., were sent, also a *Macroglossa*, apparently a new form of *M. hirundo*, Boisd.

The comparison between the females of *H. bolina*, L., from Tahiti and Rarotonga was extremely interesting. The form of female found in Tahiti and also in other islands,* although on the wing probably indistinguishable from the male, was not quite the same in pattern; for the blue fore-wing patch of the male, made up of three internervular blue spots, was replaced in the female by a white bar composed of four larger spots. Furthermore the two apical white spots in the fore-wing of both sexes was succeeded in the female, but not in

* For example, Fanning Island in the Central Pacific (Proc. Ent. Soc. Lond., 1916, p. xxv). A single individual in Mr. Simmonds' series from Rarotonga was of nearly the same male-like form.

the male, by a series of smaller spots, parallel with the hind or outer margin, and sometimes continued on to the hind-wing. Three females from Tahiti in the British Museum were also male-like, but a fourth exhibited a slight development of a brownish shade on the margins of both wings.

The five females sent by Mr. Simmonds from Rarotonga showed great variation. Their chief differences were described below, omitting the central marking of the hind-wing which was treated separately at the end.

(1) This specimen was male-like and, except for its much greater size, nearly resembled the Tahitian female.

(2) Smaller—the only one of the five which, in this respect, did not contrast with the Tahitian specimen,—darker, the white fore-wing bar overspread with scattered dark scales, the series of white spots parallel with the hind margin slightly developed, as also the orange ochreous marginal and submarginal lines in both wings, tending to invade the apical area of fore-wing.

(3) In this specimen the series of white spots, present on both wings, was more developed, as also the orange ochreous markings, especially at the apex of fore-wing.

(4) Similar, except for the still greater development and richer shade of the orange ochreous and the slightly less developed series of white spots.

(5) The white fore-wing bar overspread as in (2); the ochreous markings very pale, nearly white in the apical area. In the hind-wing the pale ochreous submarginal marking was no longer a line but a band much broader than in any other of these five females. The President, however, had captured specimens in Rarotonga with a far greater development of ochreous, recalling some of the Fiji females of *bolina*.

The relation of the central blue markings of the male hind-wing to that of the various forms of female was of much interest and strikingly illustrated by the specimens exhibited to the meeting.

The male patch was made up of blue scales, some of which becoming pink when seen at certain angles, combined with the blue to form a lilac shade. This marking usually had an

irregular white centre formed by the replacement of blue scales by white, and it was surrounded by a broad zone of darkly pigmented scales, differing from those of the general surface of the wing in that they also gave a deep blue colour by interference of light. These constituents were greatly modified in the females. In (2), (4) and (5) the only element remaining was the deep blue of the outer zone, which, invading the centre, formed a single continuous patch, evanescent in (2). In (1) and (3) the blue of the outer zone was barely visible, while the inner area, lacking the white centre, spread outwards, especially in (1), invading the area of the zone. The red scales of (1) were more abundant than in the male and therefore the lilac tint more pronounced. The patch of (3) was smaller and irregular in outline, its tint cobalt blue due to a mixture of pale and dark blue scales.

In the Tahiti female the marking was nearer to that of the male than any of the Rarotonga females, the white central scales being present and the outer zone better developed than in (1) and (3).

The relations illustrated in Mr. Simmonds' specimens of *bolina*, required to be studied in larger numbers of examples from the same and other localities, but it was hoped that the above account would be of some use as a guide. The comparisons here drawn had been greatly facilitated by Dr. Eltringham's kindly help in the rather difficult analysis of the colour effects.

East African Danaine butterflies resting, crowded in a bamboo clump, during the hot hours of the day.—Prof. Poulton said that he had received only that morning a letter from one of their Fellows—Mr. C. F. M. Swynnerton, Game Warden of the Tanganyika Territory; and he wished to call the attention of the meeting to the following interesting observations recorded by the writer :—

"*September* 19, 1920. *Dar es Salaam.*

"Here, for some weeks, *Amauris ochlea*, Boisd., and, in association with it but in smaller numbers, *A. niavius*, L., subsp. *dominicanus*, Trim., have been present in (literally) enormous numbers in the public gardens. They are completely

gregarious—I never saw this at Chirinda—and spend most of their time suspended under the twigs at the base of thickets of thorny bamboos up to a few feet from the ground. One finds them there in hundreds together at any time of the day, lethargically resting. A few are usually on the wing and feeding, and all are apt to be flushed rather readily by one's close approach; but the above is nevertheless generally correct. The swarm (for there is really only one) has shifted in the course of these few weeks from a couple of large clumps of bamboos nearer the hospital to a couple of smaller clumps further north. I had thought it might all be a matter of food-plant, but search failed to reveal the latter, and I never could see laying females. To-day, however, I spotted a single long strand of the plant I was specially looking for (*Cynanchium*) winding up through one of the two original clumps of bamboo, the leaves very badly eaten. I failed to find more, though I searched carefully, and I imagine that either it has been cleared out—I notice many dry stems of climbers cut through and their roots dug out—or that the larvae have finished it.

" The reason for the gregariousness should be interesting. It may be on the lines of the gregarious habit in *Acraea* larvae —probably enhanced advertisement. It may also be that with flowers scarce—yet they are not completely scarce— or with larval food-plant absent, the butterflies are to a small extent wintering, reserving their energies and reducing wear and tear, till things improve. I would like to watch them for a whole day before really venturing suggestions, and I may yet manage this though I am very busy and must go up country again shortly. A few *Mylothris* and *Belenois* and a very occasional *Terias* and *Melanitis* are about the only other butterflies about. That birds, by the way, attack the *Amauris* in question when really hungry—as I found them to do at Chirinda—is likely, as I usually find a few of them dead on the ground, some of them with apparent birds' bill marks and probably rejected. I am afraid I have quite given up recording instances of bird attack—I had such a surfeit of it during my experiments in Rhodesia—but I have already seen quite a number of instances in this country and saw

many in Rhodesia after my return thither. I should say that I note such attacks more readily than I used to, doubtless as the result of practice.

"*Later.* Going early one morning—6.45—I found them all on the wing, scattered and feeding. At 7.45 they were collecting under the bamboos again."

Prof. Poulton said that, so far as he was aware, this observation had never before been made in Africa. Dr. G. A. K. Marshall had observed the two E. African forms of *Hypolimnas* (*Euralia*) *dubia*, Beauv., — *wahlbergi*, Wallgr., and *mima*, Trim.—collecting together, between 3 and 4 p.m., for the nocturnal rest (Trans. Ent. Soc. Lond., 1902, pp. 491, 492), but he had never seen African butterflies congregating in shady places to avoid the sun, in the manner described by Mr. Swynnerton. Dr. Marshall had, however, found the same thing happening in Trinidad and Jamaica,—so much so, indeed, that, at the time of his visit, it was useless to attempt to catch butterflies except in the cool morning and evening hours. Dr. Longstaff's experience in many countries agreeing with that of Dr. Marshall in Africa, was summed up in the statement that "very few [butterflies] comparatively are to be seen on the move before 9 a.m., and few after 3 p.m. . . ." ("Butterfly-hunting in Many Lands," London, 1912, p. 599). Mr. N. Annandale, too, had observed that certain Siamese insects were active during the hottest hours when birds did not hunt for food, but were rarely seen in motion or indeed to be found at all in the cooler hours when their enemies were at work (Proc. Roy. Phys. Soc., Edinb., 1900, No. XXIX, pp. 439–444).

Dr. Marshall's experience in America and Mr. Swynnerton's at Dar es Salaam were therefore the precise opposite of the other observations quoted above: in the first the butterflies were active in the cool daylight hours and rested in the heat; in the second they rested in the cool hours and were active in the heat. Extended investigations in various parts of the tropics, and especially in the same locality at different seasons, with due regard to the humidity as well as the temperature of the air, would probably explain the apparent inconsistency; and it was to be hoped that Mr.

Swynnerton would continue his interesting observations at Dar es Salaam.

The PRESIDENT, Dr. NEAVE and Dr. MARSHALL commented on Prof. Poulton's exhibit.

ABERRATIONS OF BRENTHIS EUPHROSYNE AND B. SELENE.—The SECRETARY exhibited on behalf of Mr. B. G. ADAMS a magnificent collection of aberrations of *B. euphrosyne* and *B. selene*, all taken in different years in a restricted locality in N. Devon about 600 ft. above the sea. Amongst these were two specimens which appeared to be hybrids, the upperside of one being that of *B. euphrosyne* with the underside of *B. selene*, the opposite being the case with the other specimen. The two species often overlapped.

DIPTERA FROM NORFOLK.—Mr. J. E. COLLIN exhibited the following interesting species of Diptera captured on Blakeney Point, Norfolk, from July 16–24, 1920.

Hercostomus praetextatus Haliday. Described in 1855 from a single male captured in July 1854 on the Sandhills of Rossbegh Point (Kerry), and never rediscovered in Britain until Dr. Winifred E. Brenchley found two females at Blakeney Point in August 1919, a discovery which led to the search for and capture of both sexes in some numbers this year.

Pipunculus minimus Becker. A species new to the British List not hitherto considered distinct from *P. littoralis* Becker.

Limnophora aestuum Villeneuve. Also new to the British List. Mr. H. W. Andrews has found this species in Ireland, and there were one or two unidentified specimens in the Verrall Collection. It was a common species among the *Psamma* growing on the sandhills at Blakeney.

Limnophora maritima v. Röder. This name so far as the British List is concerned has been wrongly applied to the next species. The females were common on the sandy mud left exposed by the retreating tide, but only three males were captured.

Limnophora virgo Villeneuve. Only a single female of this interesting species was captured among the *Psamma* growing on the sandhills. The name is new to the "List," though previous British records of *L. maritima* apply to this species.

Limnophora biseriata Stein. A recently (1916) described

species which was fairly common on the *Psamma*-covered sandhills. It is an addition to the British List.

Tetanops myopina Fallen. A sea-coast sand-hill Ortalid not often found in collections and the only representative of the genus in Britain.

News of Russian Entomologists.

Capt. Burr said that he had been trying to obtain news of Russian Fellows of the Society and had heard definitely that M. Kuznezoff had succeeded in escaping to Finland. It was, however, feared that M. Semenoff Thian-Shanski had been beaten to death by the peasants, though it was not quite certain which of the brothers had met with this fate. Other well-known entomologists had also lost their lives, and the Museums had been to a great extent destroyed.

Mr. Wheeler observed that M. Avinoff had undoubtedly escaped, as he had seen him in the Library and had taken him home to lunch; he was now probably in Paris.

Papers.

The following papers were read:—

"Butterfly Migration in British Guiana," by L. D. Cleare, F.E.S.

"Preliminary Note on the Interpretation of Insectan and Myriopodan Structures, through a Comparison with the Structures of Crustacea," by Prof. G. C. Crampton, Ph.D., F.E.S.

Wednesday, November 17th, 1920.

Comm. J. J. Walker, M.A., R.N., F.L.S., President, in the Chair.

In reading the minutes of the previous meeting, the

Secretary observed that it was now known that M. Semenoff Thian-Shanski was still living.

Election of Fellows.

Messrs. T. H. L. Grosvenor, Walldeanes, Redhill; Edgar E. Syms, 22, Woodlands Avenue, Wanstead, E. 11; and Cyril Luckes Withycombe, 12, Prospect Hill, Walthamstow, were elected Fellows of the Society.

Nomination of Officers and Council.

The following Fellows were nominated by the Council as Officers and Council for the Session 1921–1922.

President: The Rt. Honble. Lord Rothschild, M.A., F.R.S., &c. *Treasurer:* W. G. Sheldon, F.Z.S. *Secretaries:* The Rev. George Wheeler, M.A., F.Z.S.; S. A. Neave, M.A., D.Sc., F.Z.S. *Librarian:* H. J. Turner. *Other Members of Council:* Robert Adkin; H. E. Andrewes; G. T. Bethune-Baker, F.L.S., F.Z.S.; G. C. Champion, A.L.S., F.Z.S.; J. Hartley Durrant; A. D. Imms, M.A., D.Sc., F.L.S.; James J. Joicey, F.Z.S., F.L.S., etc.; G. A. K. Marshall, D.Sc., F.Z.S.; Capt. Norman D. Riley; H. Rowland-Brown, M.A.; Comm. James J. Walker, M.A., R.N., F.L.S.; Capt. the Rev. James Waterston B.D., B.Sc.

The New House.

The Treasurer reported that the contract for 41, Queen's Gate was now signed, and announced the munificent donation of £1000 by Dr. Longstaff towards the purchase.

Exhibitions.

Further instances of the mimetic association between two Euploeines and one Danaine in Fiji.—Prof. Poulton said that he had received from Mr. H. W. Simmonds many more examples of the species tabulated in Proc. Ent. Soc., 1919, pp. lxix–lxxi. Although several other Euploeas were recorded from Fiji it was obvious from Mr. Simmonds' captures that *Nipara eleutho*, Quoy, and its mimic *Deragena proserpina*, Butl., were the dominant forms and that next in abundance among the *Danainae*, was *Tirumala neptunia*, Feld., which

flew with and mimicked the far commoner Euploeas. It was shown in the previous communication (p. lxxi) that the female *proserpina* was a better mimic of *eleutho* than the male; and the series of *neptunia* now received proved that here too the female Danaine resembled the Euploeas more closely than the male, the suppression of the greenish markings in the central and basal parts of both wings being carried much further in most examples of the former sex than in most of the latter.

The following records showed conclusively that the two Euploeas fly together in different parts of Viti-Levu and on adjacent islands and that they are often accompanied by the *Tirumala*. Evidence was also now forthcoming that the model *eleutho* was at certain times and places more abundant than its mimic *proserpina*. It was also interesting to note that whereas *proserpina* was confined to Fiji, *eleutho* had an enormous range over Polynesia.

Sept. 9, 1920.—At Levuka, on Ovalau island to the E. of Viti-Levu, on the same hill and within two minutes of each other :—1 ♀ *eleutho*, 1 ♂ *proserpina*, 1 small, dark, ♂-like ♀ *H. bolina* which on the wing would probably closely resemble the Euploeas.

Aug. 11, 1920.—On Motoriki island, S.W. of Ovalau, 1 ♀ *eleutho*, 1 ♀ *proserpina*.

At Nasinu, Lower Rewa District, S.E. Viti-Levu. *Dec.* 18–19, 1919—1 ♂ 1 ♀ *eleutho*, 8 ♂ 3 ♀ *proserpina*, 1 ♀ *neptunia*; *Jan.* 9, 1920—4 ♂ *eleutho*, 4 ♂ 1 ♀ *proserpina*; *Sept.* 4—1 ♂ *eleutho*.

At Suva, S.E. Viti-Levu. *Apr.* 7, 1919—1 ♂ *proserpina*, in addition to the one recorded in the 1919 table; *Jan.* 18-19, 1920—2 ♂ *eleutho*, 2 ♂ *proserpina*; *Jan.* 21—1 ♂ *eleutho*, 2 ♀ *proserpina*; *Sept.* 22—1 ♀ *eleutho*; Oct. 7—1 ♀ *eleutho*.

At Lami, Fiji. *Aug.* 28, 1920—2 ♂ 1 ♀ *neptunia* (the ♂ H.-W. scent-pockets eaten away, probably by ants); *Sept.* 12—2 ♂ *proserpina*.

At Waidoi Rubber Plantation, about mid-way between Suva and Navua, S. Viti-Levu. The following additions to the 1919 table printed in Proc. Ent. Soc., 1919, p. lxx :—*eleutho*, 1—June 1 : *proserpina*, 1 ♂ on each of following dates, May 20, 25, 28, June 1, 10; 2 ♂ on May 31; 1 ♀ on May 27

and on 28: *neptunia*, 2 ♀—May 27; 1* ♂—June 5. The following captures at Waidoi, after the last date of the 1919 table, include a larger proportion of *eleutho*, although much smaller than that indicated by Mr. H. W. Simmonds' latest observations in the Suva district.

"Suva, *Sept.* 23, 1920.—I must decidedly modify some of my former statements with regard to the two Euploeas. *N. eleutho* has in the neighbourhood of Suva recently been far

Dates in 1919.	*Eleutho.*	*Proserpina.*		*Tirumala neptunia.*
	♂ and ♀ alike.	♂	♀	
June 15	—	1	—	—
,, 17	—	1	—	—
,, 18	2	3	1*	—
,, 20	—	1	1	1 ♀
,, 21	2	1	1	—
,, 22	1	1	—	—
" 23	1	—	1	—
July 14	3 + 1*	1	3	—
,, 17	1	—	—	—
,, 23	1	—	1	—
Aug. 7	—	—	—	1 ♂
,, 21	—	1	—	—
,, 23	—	—	1	—
Oct. 4	—	—	1	—
,, 12	—	—	1	—
Nov. 25	1	—	—	—
,, 27	—	1	—	—
Totals	13	11	11	2

* An asterisk indicates that the label had become detached in the post, and that the date, although probable, is not certain.

commoner than *D. proserpina*, although when I got to native bush the position was immediately reversed."

New Lepidoptera from the Island of Hainan.—Mr. G. Talbot, on behalf of Mr. J. J. Joicey exhibited numerous specimens of new Lepidoptera from the island of Hainan, and made the following observations :—

During the years 1918, 1919, and the present year, the Hill Museum has received large collections of Lepidoptera from Hainan. These have been obtained by and through the exertions of Mr. C. Talbot Bowring of Hoihow. This gentleman has very generously presented all the specimens to the Hill Museum on condition that a catalogue of all the species would be prepared. We propose, therefore, to publish a complete list of the Lepidoptera from this island, and this we should have resolved upon doing in any case, because the collections sent by Mr. Bowring have increased enormously our knowledge of the number of forms already known to exist upon the island.

Mr. Bowring has spared no effort and expense to obtain specimens from different parts of the island. During the spring of this year, Mr. Young Chun, a Chinese graduate of Harvard University, was in Hainan collecting plants. He made a successful expedition to the Five-Finger Mountains in the country of the Loi savages, where the explorer Whitehead lost his life. Mr. Chun very kindly handed his collection of Lepidoptera to Mr. Bowring for transmission to us.

Although something is known already of the forms inhabiting these mountains, through the efforts of Whitehead and of a Japanese collector sent there by Lord Rothschild, the collection made by Mr. Chun contains some interesting novelties, chief among which is a form of *Kallima inachis*. The collection is not yet worked out and may contain other new forms. The same must apply to a mass of Mr. Bowring's material.

The following forms are shown :—

Papilio hipponus bowringi Prout; *P. dialis cataleucas* Roths., with the hitherto unknown female; *P. rhetenor* Westw., subsp. nov.; *P. castor hamela* Crly.; *P. aristolochiae gonipeltis* Roths., with its mimic *P. polytes* L. ♀; the aberration *astreans* Jord. of *polytes*; *Pieris nagonum* Mre.; *Danaida sita* Koll.,

subsp. nov., with the mimetic *Hestina nama* Doubl., subsp. nov.; *Limenitis dudu* Westw., subsp. nov.; *Kallima inachis* Bdv., subsp. nov.; *Charaxes marmax* Westw., subsp. nov.; *Eriboea nepenthes* Gr.-Sm.; *Penthema lisarda* Doubl., subsp. nov.; *Adolias dirtea pardalis* Mre., and its mimic *Euthalia whiteheadi* Crowley; *Stichopthalma nourmahal* Westw., subsp. nov.; *S. neumogeni* Leech, subsp. nov.; *S. howqua* Westw., subsp. nov.; *Elymnias patna* Westw., subsp. nov.; *Ragadia crisilda* Hew., subsp. nov.; *Coelites nothis* Bdv., subsp. nov.; *Crossiura pencillatum* Nicév., subsp. nov.

A Curious Cocoon.—Dr. Marshall exhibited a curious flattened cocoon from S. Italy and the larva which had been extracted from it, which superficially resembled a Hesperid. In answer to his enquiry the Rev. F. D. Morice stated that they were the larva and cocoon of a saw-fly nearly related to *Cimbex*.

Melanic Nolidae.—Dr. Cockayne exhibited a series of *Nola cucullatella*, var. *fuliginalis*, Steph., bred in June and July 1920 from Epping Forest larvae, together with type specimens from the same locality, including the seven darkest. The percentage of melanic specimens was 10%, 34 having been bred out of a total of 339. He had bred 57 specimens of the hymenopterous parasite *Meteorus fragilis*, Wesm., from this species. He also exhibited a pair of *N. confusalis* type and a pair of var. *columbaria*, Image, from the same locality to show the parallel melanic variation.

New Lepidoptera from Madagascar.—Mons. F. Le Cerf exhibited the following specimens: (1) a new species of *Lymantria*, with flesh-coloured hind-wings washed with black and grey; (2) a pair of a new and very large species of *Dasychira*, with black and white upper- and yellow under-wings, another pair of which are in Mr. Joicey's collection; (3) a new species of *Pinacopteryx* belonging to the *simana*, Hoff., group, but quite without black markings except at the apex; and (4) a male *Hyplimnas bolina*, L., from the interior of the island, east of Mananjany, with strongly marked discoidal patches and submarginal spots.

Probable Heteromorphism of Secondary Sexual Characters in Trilochana.—Mons. Le Cerf also made the

following observations on a probable case of heteromorphism in *Aegeriidae* which he had discovered in Mr. Joicey's collection. The specimen in question was closely related to the genus *Trilochana*, Moore (*Scoliomimas* Butl.), but differed by its narrower and more oval wings, its head narrower than the prothorax, its small oval eyes, and in various details of its palpi, legs and neuration. While he realised that apart from apterous females no case was known in the Lepidoptera of so many and such varied sexual distinctions, he still considered that it was an extreme case of the inversion of secondary sexual characters, since the females among these *Aegeriidae* possess the following characteristics: strongly pectinated antennae, broad head, large round eyes, a long cylindrical abdomen, legs and the extremity of the abdomen clothed with long hair, all of which in other *Aegeriidae* are characteristics of the males. All three species of *Trilochana* were described from females, mistakenly supposed to be males in consequence of the above-named characters, and it was logical to suppose that the hitherto unknown males would show inverse characteristics. The area of dispersion of these *Aegeriidae*, as shown by the specimens in various collections, corresponded with that of their Hymenopterous models. The (unfortunately mutilated) specimen in Mr. Joicey's collection probably belonged to a new local race of *Trilochana scolioides*, Moore, hitherto known from Sikkim and Indo-China.

The exhibitor illustrated the points he enumerated by drawings shown by the epidiascope.

Mr. Durrant gave other instances of males with simple and females with pectinated antennae.

Wednesday, December 1st, 1920.

Comm. J. J. Walker, M.A., R.N., F.L.S., President, in the Chair.

Election of Fellows.

Messrs. Charles Edward Clarke, c/o G. Howes, Esq., 452, George Street, Dunedin, New Zealand; Edward Wyllie

Fenton, M.A., B.Sc., Seale-Hayne Agricultural College, Newton Abbot, Devon; Mrs. Ella Frederica Meldola, 6, Brunswick Square, W.C. 1; and Mr. David Miller, c/o G. Howes, Esq., 452, George Street, Dunedin, New Zealand, were elected Fellows of the Society.

Nomination of Officers, etc.

The names of the Officers and Council nominated by the present Council for the ensuing session were read for the second time.

Exhibitions.

Rare and Local Coleoptera from Suffolk. Mr. Donisthorpe exhibited certain rare and local beetles from Suffolk:—A nice series of *Chrysomela marginata* L., taken at Freckenham in Sept. last. This rare species is a new record for Suffolk; the only southern localities previously known are Southend, Pegwell Bay, Swansea and Brighton. *Anisotoma cinnamomea* Pz., eight specimens swept at Barton Mills on Oct. 1 last, under fir trees. It was usually found under beech, and occurs in truffles, and had only previously been recorded for Suffolk by Curtis. *Anisotoma pallens* Stm., swept at Barton Mills Sept. 9, 1917. The only time it had been previously taken in Britain was in 1873, by our President, at Deal. *Dryophilus anobioides* Chevr., beaten off broom in plenty at Barton Mills, May 19 last. First taken in Suffolk at Freckenham by Dr. Nicholson in 1916. Having failed to find it at Freckenham, the exhibitor went to Barton Mills, where he knew of a large patch of broom, and found it in numbers. It had only been found in Britain before at Plumstead, Coombe Wood, Chobham, and Bradfield.

A very rare Coleopteron.—Mr. Bedwell exhibited a specimen of *Agabus melanarius* Aubé., taken on Haldon Moor, near Teignmouth, Devon, out of sphagnum in a boggy spot, on Sept. 23 last. So far as he knew there were only two previous records for this country: a single specimen taken

in the Orkneys by Mr. Syme, now in the Power Collection, and Mr. Bold's record of a specimen from Long Benton, Northumberland, which Fowler apparently considers doubtful.

Hybrid Coliads.—Mr. Sheldon exhibited a box of *Colias hyale* and *C. erate* from Sarepta, Russia, with specimens which appeared to be hybrids between these two species and also between *C. erate* and *C. edusa*.

Mr. Rowland-Brown enquired whether hybrids between *C. hyale* and *C. edusa*, which so frequently fly together, had ever been taken, but no Fellow present had ever seen one. Mr. Sheldon said that in Lapland *C. werdandi* and *C. hecla* generally occur on different ground, but that where they overlap specimens occur which appear to be hybrids. The Rev. G. Wheeler said that in the Swiss collection of the late Mr. Fison, there was a hybrid between *C. phicomone* and *C. palaeno*. Lord Rothschild remarked that he had another, and had also received two large batches of apparently hybrid Coliads; at the same time, *C. cocandica* ranges from greenish-white to orange in a district where no other orange Coliad occurs.

An Aberrant Lycaenid.—Mr. L. N. Staniland exhibited a specimen, probably of *Polyommatus icarus*, in which the spots on the margins of the wings, on the underside, are lacking. The specimen was taken in company with other Common Blues, at Fleet, near Aldershot, on June 4, 1910.

Several Fellows commented on this specimen, remarking on its near resemblance to *P. eros*.

Aberrations of Lepidoptera.—Mr. G. T. Bethune-Baker exhibited an aberration of *Melitaea didyma* with the underside of hind-wings nearly all primrose yellow with base pinkish-red; also an aberration of *Zygaena carniolica* with the fore-wings entirely suffused with red.

Local Sussex Lepidoptera.—Mr. Wheeler exhibited on behalf of Mr. F. G. Bramwell specimens of the local Zygaenid *Ino globulariae* and the still more local geometrid *Acidalia immorata*.

A Gynandromorphous Ant.—Mr. Crawley exhibited a lateral gynandromorph of *Monomorium floricola*, Jerd., taken by the late Dr. Swale in Samoa in 1917.

Lepidoptera from the Eastern Congo.—Mr. Talbot on behalf of Mr. Joicey exhibited the following Lepidoptera collected by Mr. T. A. Barns on an expedition through the region of the Eastern Congo to Ruwenzori and the Ituri. *Papilio mackinnoni* Shpe., a new race from S.E. Congo Dist.; *Mylothris ruandana* Grunb., the ♂ and hitherto unknown ♀ from the Ruanda Dist.; *Belenois solilucis* Butl., ♂ ♀, from Semliki—the ♀ represents a new colour form; *Acraea disjuncta* Gr.-Sm., typical form from Ruwenzori together with the mimetic *Neptis ochracea* Neave, taken with it; a new form with broad and continuous band on the fore-wing from the Ituri Dist.; *Acraea* sp. nov. near *leucopyga*, from Upper Congo; *Acraea* sp. nov. allied to *goetzi*, from the Kivu Dist.; *Acraea butleri* Auriv., four forms from the Kivu Dist.; *Amaurina ellioti* Butl., from the Kivu Dist.; *Euptera hirundo* Stgr., subsp. nov., from the S.E. Congo Dist., a new ♀ form; *Euphaedra eleus* Dry., subsp. nov., from S.E. Congo Dist.; *Euxanthe crossleyi* Ward., typical form (Cameroons), form transitional to *ansorgei* (Kasai Dist.), form with much enlarged stripes (Ituri Dist.), f. *ansorgei* Roths. (Uganda); *Semioptila* sp. nov., from S.E. Congo Dist.; *Dovania poecila* R. & J., a very rare Sphingid, from the Kivu Dist.; *Papilio dardanus* ♀ f. *niobe* Auriv., from Ituri; *P. dardanus* ♀ f. *trophonissa* Auriv., from the Kivu Dist.; *P. ridleyanus* Ward, and *Acraea perenna* Doubl., taken feeding together; *P. jacksoni* Shpe. ♀, and model *Amauris egialea*, subsp. nov., from Kivu Dist.; *Charaxes etheocles* ♀ f. *cedreatis* Hew., taken whilst feeding on tree gum; resembles the ♀ of *C. numenes* Hew., occurring in same region; *Planema schubotzi* Grunb., ♂ ♀, from Ituri Forest, and mimicked by *Pseudacraea eurytus ab. bicolor* Auriv.; *Planema macarista* Shpe., a new form with cell-spot on fore-wing, mimicked by *Pseudacraea eurytus*, f. *hobleyi* Neave, from the Ituri Forest; *P. hobleyi* shows the hind-wing band very sharply defined distally, which is not the case with Uganda specimens he had seen; *Acraea oberthuri* Butl., mimicked by *Mimacraea landbecki* Druce, from Upper Congo and Ituri Dist.; *Acraea uvui* Gr.-Sm. ♀, mimicked by *Vanessula milca* Hew., from Ruwenzori, found flying together; *Acraea bonasia* Fbr., mimicked by 2 *Telipna* sp.? from Upper

Congo; *Pentila hiendlemayeri* Dew., mimicked by *Mimaletis reducta* Prout, from Upper Congo and Semliki; *Powellana cottoni* B.-Bkr., taken on an oil palm in company with an *Epitola* sp.?; the *Powellana* is conspicuous on the wing but nearly invisible when it rests with wings folded; Upper Congo; *Charaxes kahldeni* Dew., with its form *ehmeckei* Dew., taken feeding together, Ituri River; *Melinoëssa* (*Rhamidava*) sp. nov. (Geometrid), mimicked by *Larinopoda emilia* Suff., from Upper Congo; *Neptis ochracea* Neave, taken together with *Acraea disjuncta* Gr.-Sm., which it very closely resembles in flight and colour, in thick forest bordering long grass. A scarce species, not more than one being usually seen at a time; *Papilio dardanus* ♀ f. *niobe* Auriv., very heavy of flight and easily caught, it resembles a large *Acraea* when flying; inconspicuous when at rest and resembles a brown leaf; *Vanessula milca*, often found flying with *Acraea uvui* Gr.-Sm., for which it may be mistaken both in flight and colouring; *Telipna* sp.? near *semirufa* Kirby, found flying with *Acraea bonasia* Flr., for which it may be mistaken; at the same place was also accompanied by another *Telipna* sp.? with broader bands; *Powellana cottoni* B.-Bkr., found in more open part of forest on oil-palm; conspicuous on the wing, but almost invisible at rest with wings folded; taken on the same tree with *Epitola* sp.?; *Charaxes kahldeni* Dew., taken with the form *ehmeckei* Dew., feeding on dung; *Euxanthe crossleyi*, which has habits similar to the Liptenids, flies high and fond of resting on dry twigs at right angles to stem, or occasionally on the bark of a tree; *Papilio dardanus trophonissa*, not known from L. Kivu; *Papilio dardanus niobe*, not known from Ituri Dist. No *Planema* f. taken in this Dist.; *Papilio jacksoni*, not known south of Ruwenzori; *Pseudacraea eurytus*, f. *hobleyi*, not known from Ituri Region before; *Papilio mackinnoni*, not known before from S.E. Congo, but recorded from Kivu; *Acraea disjuncta*, not known from the Ituri; *Acraea butleri*, the only form of *johnstoni* found in Kivu Dist. *Amaurina ellioti*, hitherto only known from Ruwenzori; *Harpendyreus reginaldi*, only known from Ruwenzori; *Dovania poecila*, only known from one ♂ type, Central Angoniland.

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Lamellicorn Beetles from Tonkin.—Mr. G. J. Arrow exhibited males and females of three species of Lamellicorn beetles (*Ectinohoplia*) from Tonkin to show a hitherto unrecorded difference between the sexes. The females were remarkable for the clothing of beautiful golden scales upon the pygidium and lower surface of the body, replaced in the males by quite dull scales. Remarking that it was very unusual to find females of any insect more brilliantly adorned than the males, Mr. Arrow called attention to the fact that in the present instances the golden scales were found only upon a part of the body where they were concealed in the ordinary position. Of one of the three species (*E. suturalis*) only one sex has so far been described, while the other two are new.

Boreus hyemalis, female, and eggs.—Mr. Withycombe exhibited specimens of this insect from Epping Forest, first seen on Nov. 13, in company with a small Carabid beetle, *Notiophilus palustris*, which somewhat resembles it at first sight.

A bred Ornithopteron from Selangor with precise pupa-cases.—Prof. Poulton exhibited three (out of five) males and three females of *Troides helena cerbera*, Feld., bred, July to September, 1920, by Mr. W. A. Lamborn, from larvae or pupae found at Ulu Gombak, thirteen miles from Kuala Lumpur, F.M.S. One female larva pupated July 11 and emerged about 8.0 a.m. on July 18—a very short pupal period for so large an insect. One male was found hanging to its pupa-case in the forest at 9.0 a.m. on July 18. Each of the six butterflies was accompanied by its pupa-case, one of each sex being mounted so as to show respectively the external characters of a female pupa on the 8th abdominal segment, and of a male on the 9th. The sexual differences could be detected by the naked eye.

The flight of certain Papilionidae sometimes maintained by the forewings alone.—Prof. Poulton said that Dr. H. F. Standing had written to him as follows on the flight of *Papilio* (*Pharmacophagus*) *antenor*, Drury :—" On the wing it looks like a bird, the hind wings seeming to take little part in the flight and looking like the body of a bird." The obser-

vations were made, 1917–1918, at Maintirano, near the middle of the W. coast of Madagascar. Similar observations on *Troides amphrysus flavicollis*, Druce, had been recorded in greater detail by S. B. J. Skertchly in Ann. Mag. N.H., Ser. 6, vol. IV, 1889, p. 218 :—" The male in basking along the foliage on sunny river-sides [in British North Borneo] often flies slowly along, moving only its fore wings, the hind wings drooping at an obtuse angle to the line of flight, trailing like a rich robe of golden silk. . . . In such flight the fore wings only move through a small angle." Speaking of the hair-fringed inner marginal fold (found in males of the *Aristolochia* or *Pharmacophagus* Swallowtails) Skertchly wrote of the same *Troides* (*l. c.*) :—" In normal flight and when at rest this pouch is closed, but when the hind wing is drooped the pouch opens. It may therefore be a scent-pouch and this peculiar flight the normal courting flight."

Mr. E. E. Green said that he had frequently noticed the curiously laboured flight of *Troides darsius*, Gray, in Ceylon; but had never formed any theory to account for it. Prof. Poulton's remarks now afforded a perfect explanation of the peculiarity. Mr. Green had noticed the flight more particularly when the male was courting a female. On one occasion, while riding his bicycle along the main drive of the Peradeniya Gardens, he came upon a courting couple hovering at about the height of his head. As he passed, he put up his hand and actually caught the male, by the under part of the thorax, between his finger and thumb !

Mr. T. H. L. Grosvenor said that in the common *Papilio* (*Laertias*) *polytes*, L., it was quite a usual occurrence for the males to carry the secondaries apparently motionless, especially during feeding when flying from flower to flower; also, when settled on a bloom, it would let these wings droop, as if they were quite useless, or broken, at the same time slowly opening and shutting the primaries. Such movements and attitudes were not seen in any other species, nor were they witnessed in the female of *polytes*, which are more retiring than the males, or in the males themselves when flying in the open and round muddy pools. Mr. Grosvenor's observations were confirmed by Mr. Joy.

Papers.

The following papers were read :—

"A Description of the Female of *Chiastopsylla godfreyi*, Waterst., with further notes on the Genus," by Capt. the Rev. J. Waterston, B.D., B.Sc.

"On a New African Fig-insect, *Blastophaga dyscritus*, n. sp.," by the same.

ANNUAL MEETING.

Wednesday, January 19th, 1921.

Commander James J. Walker, M.A., R.N., F.L.S., President, in the Chair.

The Rev. G. Wheeler, one of the Secretaries, read the following

Report of the Council.

The Session now concluding has been one of various and important changes, which have, however, left the Society in a very satisfactory position. Although we have had an unusual number of losses, 37 in all, occasioned by the death of 13 Fellows, the resignation of 19, and the removal of 5 for non-payment of subscriptions, yet these losses have been far more than counterbalanced by the unprecedented number of those who have this year joined our ranks, no less than 72 Fellows having been elected during the year 1920. The Society now consists, so far as can be ascertained, of 12 Honorary, 2 Special Life Fellows, and 656 Ordinary Fellows making a total of 670. It is still, however, unfortunately, uncertain whether the Hon. Fellow A. P. Semenoff Thian-Shanski has been assassinated in Russia.

The vacancy in the Trusteeship caused by the death of Lord Walsingham has been filled by the appointment of Prof. Poulton.

Owing to the greatly increased and continually increasing cost of publication, the Transactions of the Society are again of smaller proportions than in recent years; they consist, however, of 418 pages, and contain 18 papers by the following authors :—

G. J. Arrow, F.Z.S.; Surgeon-Commander Malcolm Cameron, M.B., R.N. (2); G. D. H. Carpenter, M.B.E., D.M., etc.; T. A. Chapman, M.D., F.R.S., etc. (2); L. D. Cleare; J. E. Collin, F.Z.S.; G. C. Crampton, Ph.D. (2);

F. A. Dixey, M.A., M.D., F.R.S., etc.; H. Scott, M.A., D.Sc.; G. Talbot; H. J. Turner; Capt. the Rev. J. Waterston, B.D., B.Sc. (3); and C. B. Williams, M.A. Of these 4 refer entirely to Lepidoptera, 3 to Coleoptera, 2 to Hymenoptera, one each to Diptera, Isoptera and Orthoptera, and the rest are of Biological interest. They are illustrated by 4 coloured, 2 half-tones and 5 line-block plates, 2 maps, and several text-figures. The cost of one coloured plate is borne by Dr. Chapman, and that of 4 line-block plates and the text-figures by Mr. Collin; the originals have in all cases been given by the authors, and Dr. Carpenter contributed £10 towards the cost of his two coloured plates. In addition Mr. Joicey paid half the cost of Mr. Talbot's paper and a donation of £50 was received from Jesus College, Oxford, towards the cost of the Society's publications.

The Proceedings will consist of about 90 pages and are illustrated by 4 black and white plates the cost of which is borne by Lord Rothschild.

The great increase in the expenses of the Society, caused principally by the ever-increasing cost of publication, has rendered necessary an increase in the Entrance Fees and Subscriptions, the abolition of composition for Life Fellowship, and other changes. This necessity and various details principally connected with the removal of the Society to new quarters have brought about many changes in the bye-laws, which received somewhat drastic revision at a Special Meeting held for that purpose on May 5th.

The Housing Sub-Committee has issued the following Report, to which it is only necessary to add that Mr. Robert Adkin, Dr. G. A. K. Marshall and Mr. W. G. F. Nelson have been appointed Trustees for the Debenture Holders.

Report of the Housing Sub-Committee.

In view of the practical completion of their task, the Housing Sub-Committee feel that this is a suitable occasion on which to record the steps that have led to 41, Queen's Gate, South Kensington, being acquired as the permanent home of the Society.

The Sub-Committee, consisting of the Honble. N. C. Rothschild (Chairman), Mr. W. G. Sheldon and Dr. S. A. Neave, was originally appointed by the Council to consider the whole question of new quarters for the Society, and in the first place, to endeavour to obtain free accommodation from the Government at Burlington House or elsewhere.

After consideration it was decided to approach the First Commissioner of Works through the Royal Society, this body, according to an entry in the Council Minute-book of our Society, dated so far back as 1856, having promised that they "would watch the interests of the non-accommodated societies in the event of the Government providing further accommodation."

The Secretary of the Royal Society, Mr. W. B. Hardy, was extremely helpful, and personally interviewed the First Commissioner on our behalf. Whilst sympathetic with the idea, the Commissioner explained that he had no authority to grant accommodation to a learned Society in any other building than Burlington House, which was already full, and that in view of the present financial position the probability of any departure from this policy being approved by the Treasury for many years was extremely remote. He suggested, however, that there was a remote possibility of some accommodation becoming available in the offices of the Civil Service Commission at Old Burlington House. On further inquiry by the Sub-Committee it was found that this prospect was so extremely uncertain as not to merit further consideration.

In the face of this position the Sub-Committee considered that as the Society could not continue to occupy its present very inadequate accommodation without becoming absolutely moribund, there were two courses open to it :—

1. To rent larger premises.

2. To purchase a Building, which should be freehold if possible, and to adapt it to suit the requirements of the Society so that it might become possessed of a permanent home.

With respect to the first of these alternatives, the Sub-Committee were unable to find any suitable accommodation, and it was felt that even if it was obtainable, it would not provide a permanent solution of the Society's difficulties, and

in view of its growth and prospects, the present congestion would almost certainly recur in a few years.

The second alternative seemed the only satisfactory method of dealing with the question, and the Sub-Committee, with the Council's consent and approval, proceeded to develop it.

The principal difficulty that confronts all such bodies as ours from time to time is their tendency to outgrow their accommodation, especially as regards their libraries. It therefore seemed desirable to acquire premises with much larger accommodation than present requirements demanded, and with a room sufficiently large to be used as a meeting-room, or alternatively, space on which to erect one. It was realised that whilst the cost of erecting new buildings at present is prohibitive, there were a certain number of large, roomy old-fashioned houses, which not being suitable any longer for their original purpose, could be acquired on reasonable terms. It was thought that if such a house could be purchased, the surplus accommodation could be let until required by the Society to other similar bodies, several of whom were without rooms.

It was considered that for the sum of £10,000 one of these old houses could be acquired and adapted for the Society's purpose.

At this juncture the Society received an offer from the Imperial Bureau of Entomology to the effect that, provided the site selected was near the British Museum (Natural History) at South Kensington, they were willing to lease the portions of the building not required by the Society.

In view of the advantages to the Science of Entomology that obviously would accrue by having the two bodies under the same roof, the Council could only consider the offer favourably, and the Sub-Committee proceeded to search for suitable premises in the required position. The task was a difficult one, for the requirements of the Imperial Bureau made it incumbent that the premises should be within the very limited area of practically three roads, *i. e.* Cromwell Road, Queen's Gate and Prince's Gate, and within this area the great majority of the houses that were for sale were too small, were not freehold, or were unsuitable in some other way, and of the few

that were suitable, some were too expensive and others restricted to private occupation only.

After a very long and persistent search and after having twice found a suitable house which at the last moment it was not found possible to secure, No. 41 Queen's Gate was purchased. This house, which will be the future home of the Society, is freehold. It is extremely well built, and contains twenty-three rooms, almost all of which are large. It includes on the first floor a room capable of seating 150 persons, which will be suitable for a meeting-room for a number of years. On the ground-floor there is ample space for the library, and there is also a Council-room which can be used as a Club-room when not required for Council or Committee meetings. On the upper floors, and in the basement, there is adequate accommodation for the Imperial Bureau. At the rear of the premises there is a space at present occupied by kitchens and a garage; this comprises a sufficient area on which it is possible to erect at any time a meeting-room much larger than that which will be used in the immediate future, and as the walls of the present buildings are up to the level that will be required for the new room it could be very economically formed, and difficulties with respect to ancient lights are not likely to arise. In the meantime the garage should be let for a considerable rental, which will substantially assist the finances of the Society.

The purchase price of these premises was £6250, and in view of the facts of their suitability, that they probably cost almost double this sum to erect, and that 25 years ago they were mortgaged for £10,000, and therefore presumably were considered worth £15,000, the purchase cannot be considered anything but a most advantageous one for the Society.

They do not require structural alterations to fit them for the use of the Society and the Imperial Bureau. They have been re-decorated throughout, and some minor sanitary alterations have been made. The Imperial Bureau have moved in, and the Library has been removed from Chandos Street and is now being re-arranged. A Caretaker and a Sub-Librarian have been appointed, and as soon as the necessary furniture has been purchased, the Society can hold its meetings in the new home.

The cost of practically the whole of the items of expenditure which the Society has had to incur in purchasing and fitting up the new home being now known, the Sub-Committee can confidently say that the estimated cost of the scheme, *i. e.* £10,000, will certainly not be exceeded, and there is a probability of the total required being less than this sum.

The Sub-Committee deeply regret that owing to ill-health they have been deprived of the valued co-operation of their Chairman, the Honble. N. C. Rothschild, during the greater portion of the time in which their work has been carried out. They have co-opted Messrs. E. C. Bedwell, G. Bethell and W. G. F. Nelson, who have rendered very valuable service, and to whom the thanks of the Society are due.

The Librarian reports :—

That 398 Volumes have been issued for Home reading as against 357 Volumes last year. The Library has also been largely used for the purpose of reference.

Thirty-five Volumes and a large quantity of Separata have been added to the Library, mainly by presentations. Among the purchases the acquisition of Seitz's " Macrolepidoptera of the World," and Culot's " Noctuelles et Géomètres d'Europe " are worthy of note.

The Report was adopted on the motion of Mr. H. J. Turner, seconded by Mr. Stanley Edwards.

The Treasurer's Report.

The Treasurer then read the following Report :—

The year 1920 will always be memorable in the annals of the Society by reason that after at least seventy years of almost constant effort, it has at last succeeded in permanently solving the vital question of providing adequate housing accommodation. This question is dealt with in the report of the Housing Sub-Committee, and it is only necessary for me here to touch upon one or two aspects of the finance involved.

Of the sum, £10,000, asked for by the Council to finance the scheme, £8514 18*s.* 6*d.*, including £3404 18*s.* 6*d.* donations, was promised up to December 31st last, and of this amount £7825 18*s.* 6*d.* had been received.

When every one of the Contributors has loyally and generously done his or her best to assist the Society it is difficult to particularise, but I feel that reference should be made to splendid outstanding donations of £1000 from Dr. G. B. Longstaff, and £500 from the Honble. N. Charles Rothschild.

Whilst the result is so far extremely satisfactory it will be seen that there is a considerable sum not at the moment in sight, and the President has recently issued an appeal to those Fellows who have not yet contributed to do so as soon as possible. The Appeal expresses a hope that the donation fund will eventually reach £5000, and explains that if this figure is arrived at the financial position of the Society will be assured.

I sincerely trust this appeal, which has my entire support, will have the desired effect, and in view of the fact that so far only 91 Fellows, or about 14 per cent. of the entire number, have come to the assistance of the Society, I have no doubt but that it will, when the whole of the contributions have been received.

I feel sure every one will realise that the important benefit that will accrue, not only to the Society, but to the Science of Entomology, will determine *all* the Fellows to whom a contribution will not be a real hardship to themselves or those dependent upon them, to see it through. I would like to point out that *all* contributions, however small, will be gratefully received.

The Society has very reluctantly been compelled by the greatly increased cost of everything to raise the Annual Subscription to £2 2*s*. 0*d*. for the future, but in doing so it was felt that an exception should be made in favour of any present Fellow to whom the increase would be a serious hardship, and that these should have the option of continuing to pay the old subscription of £1 1*s*. 0*d*. per annum; this subscription, however, does not entitle them to receive the Transactions. It was necessary that the names of any Fellows who felt obliged to avail themselves of this offer should be known at the earliest possible moment, in order that the numbers of copies of the Transactions that would be required for the year 1921 could be ascertained, and for this reason they were asked by the President in a letter sent to all the Fellows with a copy

of the revised Bye-Laws, to communicate to me their intention by October 31st last.

In view of the fact that the old subscriptions do not now cover the Society's Establishment charges, it is a matter of sincere congratulation that extremely few of the Fellows have been compelled to avail themselves of this concession.

The Council feel that the Fellows as a body have splendidly come to the assistance of the Society in this very important respect, and they desire to express the gratitude they feel for the help so generously rendered.

The Admission Fee has been increased to £3 3*s*. 0*d*., and it will in future apply to all Fellows elected into the Society, whether residing in the United Kingdom or elsewhere.

Compounding for the Subscriptions has been abandoned; in this respect the Society follows the lead of other Societies including that of The Linnean Society which has recently abolished compounding.

Some of the Fellows who have compounded for their subscription expressed their desire to share in the burden which had been placed upon the Society by the increase of its expenses, and an appeal was sent by the President in June last, with the result that the following Fellows volunteered to assist the Society, either by paying an extra Compounding Fee of £10 10*s*. 0*d*., or by making an annual payment of £1 1*s*. 0*d*. per annum: Sir J. T. D. Llewellyn, the Rev. F. D. Morice, and Messrs. C. H. Andrewes, H. E. Andrewes, G. J. Arrow, C. T. Bowring, P. A. Buxton, C. Cave, W. H. B. Fletcher, E. E. Green, K. Jordan, W. J. Kaye, J. Spedan Lewis, H. Main, J. C. Moulton, B. S. Ogle, M. A. Phillips, W. D. Robinson Douglas, P. N. Whitley, and R. S. Wilson. The Council desires to express its sincere thanks to those Fellows for the help they have given to the Society.

The Compounding question, by these donations and the allotment of half the Admission Fees, is placed in a considerably better position, for the income arising out of the Compounding Fund will next year equal about 16*s*. per Compounding Fellow, instead of 10*s*. 5*d*. a year ago.

From the point of view of the usual items of income and expenditure which are dealt with in the financial statement,

the position of the Society may be considered to be quite satisfactory.

The amount received from the current year's subscriptions is again a record, 545 subscriptions having been received as against 488 in 1919, an increase of 57. The amount of subscriptions in arrears has again decreased from £84 3*s*. 0*d*. due from 47 subscribers to £67 6*s*. 0*d*. due from 42 subscribers. Admission Fees amount to £35 14*s*. 0*d*. more than in 1919. The result of the sale of Proceedings is an increase of £27 2*s*. 3*d*. on that of the previous year. The donations in aid of the Publications are in excess of those of 1919 by £122 0*s*. 9*d*., for which the donations mentioned in the Council's Report are chiefly responsible. The gratitude of the Society is due to these generous donors.

The total income, chiefly owing to the above-mentioned items, shows the large increase of £321 16*s*. 9*d*.

About two years ago the General body of Fellows assembled at an ordinary meeting passed a resolution asking the Council to provide Tea after the meetings without any cost to the Fellows. It was felt by the Council that this should be done when circumstances permitted, and as the Society is now in possession of its own home it seems a fit and proper time in which to commence to offer this hospitality to the Fellows and guests. The tea fund will therefore disappear in future.

The payments side of the balance sheet shows a large increase, which includes for salaries £15 16*s*. 6*d*. Several valuable books which the Library urgently required have been purchased out of the Library Fund, the cost of new Books has increased by £33 6*s*. 11*d*. Binding and Repairs to the Books have cost £35 14*s*. 10*d*. more than in 1919. I fear the present state of the Library will necessitate a considerable sum being spent upon repairs in the near future. The cost of Printing is over £200 less, but this is accounted for by the publications issued in 1920 consisting of matter concerning that year only, whereas a considerable portion of the publications which should have appeared in 1918 were issued in 1919 as well as the whole of the publications of the later year. Sundry printing, stationery and postage are accountable for considerable increase.

I regret that the Society's Printers have increased the cost

of its publications again within the last year by nearly 30 per cent. This question must receive the serious and careful consideration of the Council during the coming year.

The large stock of Publications which has been for several years at the Natural History Museum, has hitherto stood in a heap in one of the semi-public passages in the basement. It was impossible from this to select any volumes required, or to know what the heap actually contained. Through the intervention of Mr. J. H. Durrant the authorities of the Museum very kindly offered the Society a much more suitable position in which to store this valuable property. Racks were made and the Publications were placed in such a position and in such order that any particular volumes are always accessible. The cost of this operation was £15 18*s.* 4*d.*

The balance at the end of 1919 of £207 3*s.* 0*d.* standing to the credit of the General Account, has been during the year transferred to the Housing Fund. In consequence of this, and of certain unforeseen expenses which had to be incurred towards the close of the year, there is a small deficit in the General Account of £1 0*s.* 8*d.* On the other hand there are satisfactory balances of £206 7*s.* 0*d.* in favour of the Compounding Fund which will be invested at once, and £51 5*s.* 1*d.* in favour of the Library Fund (New Books).

I regret to report that in consequence of the general depreciation of stocks, there has been a further fall during the year in the Society's holdings in Consols and Birmingham 3 per cent. of £98 1*s.* 7*d.*

I should like here to say something of the future financial prospects of the Society, but there are certain factors which are not yet sufficiently developed to enable me definitely to do so; so far, however, as I can see from present indications, and providing certain sources of income and capital materialise as they should reasonably be expected to do from information I possess, I have no hesitation in saying that the Society is in sight of the end of its very serious difficulties, and I trust that in its new home it will develop to standards of prosperity, progress, and usefulness far higher than it has risen to hitherto. I hope to refer to this question again a year hence.

The Treasurer also read the Financial Statement, and

both Report and Accounts were adopted on the motion of Mr. Bedwell, seconded by Mr. A. E. Tonge.

The President declared the Fellows nominated by the Council as Officers and Council for the ensuing Session to be duly appointed in accordance with the Bye-laws.

The President then read an Address, after which a Vote of Thanks to him was passed on the motion of Lord Rothschild, seconded by Mr. Elwes, to which he replied.

A vote of thanks to the Officers was then proposed by Mr. A. H. Jones, special mention being made of the retiring Librarian Mr. G. C. Champion; this was seconded by Dr. Cockayne and passed, the Treasurer and the two Secretaries replying.

THE ENTOMOLOGICAL SOCIETY OF LONDON.

TREASURER'S ACCOUNTS for the Year ended December 31, 1920.

(Presented at the Annual Meeting, January 19, 1921.)

RECEIPTS AND PAYMENTS ACCOUNT.

Receipts.	£ s. d.	£ s. d.
To Cash at Bank as per last Account—		
General Account	497 3 0	
Westwood Bequest Fund Account	65 3 8	
Compounding Fund Account	87 3 0	
Library Fund Account	33 7 6	
Tea Fund Account	3 1 0	
		685 18 2
„ Interest on Investments—		
Dividend on Consols	31 6 3	
Dividend on War Loan	5 15 7	
Interest on Deposit	23 11 2	
Interest on Birmingham 3 % Stock (Westwood Bequest)	7 3 8	
		67 16 8
„ Admission Fees		115 10 0
„ Annual Contributions—		
1920	534 9 0	
Arrears	31 10 0	
In Advance	35 11 0	
		601 10 0
(Subscriptions in respect of year 1920 received in 1919, £32 11*s.*)		
„ Compositions		148 12 0
„ Sales of Publications		152 9 8
„ Donations in aid of Publications		126 3 6
„ Contributions to Tea Fund		5 2 6
„ Miscellaneous Receipts		0 8 4
„ Housing Fund Receipts	7,880 11 10	
Less Payments	6,257 6 3	
		1,623 5 7
		£3,526 16 5

W. G. Sheldon, *Treasurer.*

Payments.	£ s. d.	£ s. d.
By Rent		70 7 6
„ Salaries		69 14 6
„ Library—		
New Books	39 17 5	
Binding, Repairs and Insurance	46 16 3	
		86 13 8
„ Cost of Publications—		
Printing	444 14 0	
Illustrations—		
General	£107 7 4	
Westwood Bequest	72 7 4	
	179 14 8	
Distribution	26 15 7	
		651 4 3
„ Sundry Printing and Stationery		74 13 1
„ Postage		27 15 7
„ Audit Fee		5 5 0
„ Purchase of £90 3*s.* 6*d.* 5 % National War Bonds—Cost		87 3 0
„ Miscellaneous Payments		13 11 6
„ Re-arranging Stock of Transactions at Natural History Museum		15 18 4
„ Donation to the Godman Monument		5 5 0
„ Tea and Light Refreshments—		
Tea Fund	8 3 6	
General Fund	6 16 6	
		15 0 0
„ Transfer to Housing Fund		207 3 0
„ Cash at Bankers' on Deposit and Current Accounts—		
On General Account	316 4 4	
On Compounding Fund Account	206 7 0	
On Library Fund Account	51 5 1	
On Housing Fund Account	1,623 5 7	
		2,197 2 0
		£3,526 16 5

We have examined the above Account of Receipts and Payments with the Books and Vouchers and certify it to be in accordance therewith. Vouchers for all payments have been produced to us.

The Bankers have certified the correctness of the Cash Balances and that they hold the Securities for the Investments.

23, *Queen Victoria Street, London, E.C.* 4.
January 11, 1921.

W. B. Keen & Co., *Chartered Accountants.*

City

WESTWOOD BEQUEST FUND.

	£	s.	d.		£	s.	d.
To Balance at Bank, January 1, 1920	65	3	8	By Expenditure on Illustrations	72	7	4
,, Interest on Birmingham 3% Stock (£239 12*s.* 4*d.*)...	7	3	8				
	£72	7	4		£72	7	4

COMPOUNDING FUND.

	£	s.	d.		£	s.	d.
To Balance at Bank, January 1, 1920	87	3	0	By Investment in £90 3*s.* 6*d.* 5 % National War Bonds 1928 (3rd Series)—Cost	87	3	0
,, One-half of Admission Fees received in 1920	57	15	0				
,, Compositions received in 1920	148	12	0	,, Cash at Bank, December 31, 1920	206	7	0
	£293	10	0		£293	10	0

LIBRARY FUND (NEW BOOKS).

	£	s.	d.		£	s.	d.
To Balance at Bank, January 1, 1920	33	7	6	By Expenditure on New Books	39	17	5
,, One-half of Admission Fees received in 1920 ...	57	15	0	,, Cash at Bank, December 31, 1920	51	5	1
	£91	2	6		£91	2	6

TEA FUND.

	£	s.	d.		£	s.	d.
To Balance at Bank, January 1, 1920	3	1	0	By Caterer's Account	8	3	6
,, Contributions received during year	5	2	6				
	£8	3	6		£8	3	6

HOUSING FUND.

	£	s.	d.		£	s.	d.
To Transfer from General Fund	207	3	0	By cost of Purchase of Freehold Premises—41 Queen's Gate	6,250	0	0
,, Subscriptions and Donations	2,779	5	6	,, Sundry Expenses	7	6	3
,, Bank Interest	54	3	4	,, Cash at Bank—			
,, Issue of Debenture Bonds carrying Interest at 5 % per annum from November 1, 1920	4,840	0	0	On Deposit £900 0 0			
				On Current Account 723 5 7			
					1,623	5	7
	£7,880	11	10		£7,880	11	10

W. G. SHELDON, *Treasurer.*

MEMORANDUM

AS TO ASSETS AND LIABILITIES AT DECEMBER 31, 1920.

Assets.

	£ s. d.	£ s. d.
To Arrears—		
Annual Contributions ... £67 6 0		
Admission Fees 6 6 0		
Contributions to Publications 22 9 1		
Income Tax Deducted in Error 2 10 9		
	98 11 10	
Less not considered good	33 12 0	
		64 19 10
„ Present value of—		
£1,354 2*s.* 2*d.* Consols 2½ % at 45 (Cost £1,233 3*s.*), Compounding Fund		609 6 0
£239 12*s.* 4*d.* Birmingham Corporation 3 % Stock at 49 (Cost £250), Westwood Bequest		117 8 1
£137 4*s.* 6*d.*, 5 % National War Bonds 1928 (3rd Series) at 93 (Cost £134 8*s.*) Compounding Fund		127 12 0
„ Freehold Premises—41 Queen's Gate— Cost of Purchase		6,250 0 0
„ Cash at Bank—		
On Deposit 1,300 0 0		
On Current Account 897 2 0		
		2,197 2 0

W. G. Sheldon, *Treasurer.*

Liabilities.

	£ s. d.	£ s. d.
By Cost of Printing Transactions Parts III—V, 1920; Cost of Plates and Sundry Unpaid Accounts		317 5 0
„ 5 % Debentures issued to provide for purchase of Premises—41 Queen's Gate	4,840 0 0	
Interest thereon at 5 % per annum from November 1 to December 31, 1920	19 6 8	
		4,859 6 8

THE PRESIDENT'S ADDRESS

Ladies and Gentlemen,

The session which terminates with this evening's Meeting has undoubtedly been one of the most eventful in the whole history of the Society. In the first place, mainly owing to the generous response of a large body of our Fellows to the appeal for the funds necessary to carry out the undertaking, and to the energetic efforts of our indefatigable Treasurer, we have at last been able to secure as our own property a home which we trust will be worthy of the traditions and dignity of the most influential association of Entomologists in existence. Our new home will be shared with us, for some years in any case, by the Imperial Bureau of Entomology, and thus its importance and utility as the head-quarters of our Science in the British Empire will be enhanced in no small measure. Moreover, our new and ample accommodation will enable the treasures of our Library to be displayed to far greater advantage, and to be rendered much more accessible and available to our Fellows, than they have been for so many years in the cramped and congested space they have of necessity occupied. We deeply regret, however, that the valuable services of Mr. G. C. Champion, our Honorary Librarian for the last thirty years, are no longer available to us. During the long period in which he has held this office, his unfailing attention to its arduous and responsible duties, and the conspicuous ability with which these duties have been performed, have earned for him the unfeigned gratitude of the Society as a body; and it must not be forgotten that to him we owe the first printed catalogue of our great collection of Entomological works, as well as its

"Supplement," issued a few years afterwards. In our new Honorary Librarian, Mr. H. J. Turner, I am convinced that we shall find a worthy successor to Mr. Champion in this important office.

The acquisition of our new premises has not been free from difficulties, legal and otherwise; and we are greatly indebted to our Fellow, Mr. W. G. F. Nelson, for his most kind and valuable advice and assistance in enabling us to surmount these obstacles. The preparations for the occupation of our new home proceed apace, and we assemble this evening for almost, if not quite, the last time in the room in which, ever since the year 1874, our meetings have been held. It is only fitting here to acknowledge the cordial relations that have subsisted between the Medical Society of London and ourselves, during the long period of our tenancy of their rooms.

In common with all other scientific Societies, we have felt severely the pinch of the present hard times, and it has been found imperatively necessary to increase our Entrance Fee and Annual Subscription very materially. This increase, however, has not prevented the addition to our ranks of an unprecedented number of new Fellows, and our losses by resignation and by death have been more than made good. The cost of paper, of printing, and especially of every form of illustration, instead of becoming less as we hoped last year, continues ever to increase, and is now almost prohibitive; our Transactions have in consequence suffered somewhat, and though the quality of their contents remains as high as ever, they are smaller in bulk than has been the case for many years past, and it has been necessary to defer the publication of several important papers.

During the past year we have lost by death thirteen of our colleagues, including our senior Fellow, the Rev. Henry S. Gorham, who joined the Society as long ago as 1855. He possessed an intimate knowledge of British and exotic Coleoptera, and his Entomological writings, all of which deal with this Order of Insects, extend over a period of forty years. Among these the most important are the "Endomycici Recitati," published in 1873, and his contributions to the "Biologia Centrali-Americana," in which great work he was

responsible for the *Malacodermata*, *Erotylidae*, *Endomychidae* and *Coccinellidae*. Another veteran who has gone from among us, although he was rarely seen at our meetings, is Mr. Alfred E. Hudd of Bristol, an accomplished antiquarian as well as Entomologist, whose election to the Society dates from 1865. By the untimely death of Mr. Frank Milburn Howlett the Society has been deprived of an Entomologist of great acquirements and even greater promise, especially in the biological and physiological aspects of our Science; and the same may be said of the late Dr. Charles Gordon Hewitt, the Dominion Entomologist of Canada, whose work was on closely similar lines. Another serious loss is that of Prof. Leonard Doncaster, F.R.S., whose researches in the field of genetics mark an era in biological science; and in particular his discovery in 1906 of the phenomena of sex-determination in *Abraxas grossulariata*, as the result of an elaborate series of breeding experiments, is of the greatest interest to Mendelians. The death within the last few days of Dr. H. H. Corbett and Mr. J. W. Carter deprives Yorkshire of two of its most prominent Entomological workers; two well-known Dipterists have passed away in the Marchese Piero Bargagli and Mr. Frederick C. Adams; and Australia has lost her premier Arachnologist in Mr. William J. Rainbow, the Entomologist to the Australian Museum, Sydney, whose death took place in November 1919. To these may be added the names of Commander the Hon. Richard O'B. Bridgeman, R.N., F. M. Campbell, and James T. McDougall, respecting whom, however, I have no particulars; nor must we omit the names of Frederick Herschel Waterhouse, the last survivor of a family of distinguished Entomologists, and of William West, known to most of us as a frequent visitor and exhibitor at our meetings for many years past, although neither was a Fellow of the Society.

I now proceed to the Entomological essay which custom requires of the President on these annual occasions.

Some Aspects of Insect Life in New Zealand.

The choice of the subject of my Address has been determined by two considerations. First of all, nearly twenty

years ago, during my last commission abroad in H.M.S. "Ringarooma," it was my good fortune to spend more than a year in New Zealand waters; to make the acquaintance of many able and enthusiastic entomologists in the Dominion; to consult most of the principal collections of New Zealand insects in the Museums and in private hands; and to carry away with me some of the most pleasant memories of my life, gained in acquiring first-hand experience of these insects in the field. Secondly, this experience has enabled me fully to realise the extreme interest and importance of the entire New Zealand fauna, and the fascinating field of research and speculation as to its origin and affinities, which it presents to the student of the geographical distribution of animal life. On some of these problems I propose to touch, however lightly, in the course of this Address, which in addition may have some little value as a summary of our knowledge of the Entomology of New Zealand, brought up as nearly as possible to the present date.

It has become a common custom to speak of New Zealand as the "Britain of the South," but it would be difficult to find two regions, nearly equal in area and both in the Temperate Zone, more utterly diverse in physical and faunistic conditions. The British Islands are essentially a part of the great Euro-Asiatic continent, from which they were separated as it were yesterday in geological time; and their insect fauna is but a greatly reduced edition of that of Europe, and includes only a very limited number of species which may be regarded as peculiar. New Zealand, on the contrary, has almost certainly not been directly connected with any of the great land-masses since the commencement of the Tertiary period at latest, and it possesses in consequence the most isolated and precinctive fauna of any region in the whole world. From Australia, the nearest land which may be regarded as a continent, the islands are separated by the Tasman Sea, an extent of more than a thousand miles of storm-swept and profoundly deep ocean, and the coast of South America is at least four times as far away across the Pacific. Southwards, a vast expanse of deep ocean, broken only by one or two groups of small islands, extends to the eternal ice of the Antarctic

Continent; and only to the northward do we find evidence of a former connection with other regions, in the submarine plateau included within the thousand-fathom line of soundings which surrounds New Zealand and its satellite islands, extending nearly as far as New Caledonia, and probably indicating the limits of an ancient continent of which these islands are the sole relics at the present day.

New Zealand may on the whole be regarded as an eminently diversified and mountainous land, its highest summit, Mount Cook (Aorangi) in the Southern Alps, attaining an elevation of 12,347 feet; and as the Islands extend over fourteen degrees of latitude, from 34° 25′ to 47° 20′ S., almost every variety of climate except that of the Tropics may be found within their limits. The rainfall varies from about 25 inches per annum in the drier parts of the South Island, to as much as 150 inches in the Sounds on the south-west coast, which are exposed to the full force of the prevailing westerly winds of those latitudes; and with the usually moderate range of temperature, and the general abundance of sunshine, the conditions throughout the Islands are favourable to vegetable life in an eminent degree. The first European visitors found the whole country, except on the higher slopes of the mountains and a few limited lowland tracts, covered with dense forest, which in the dimensions of its individual trees, the luxuriance of the undergrowth, and the profusion of epiphytes, climbing plants and especially of ferns of endless variety and of all sizes, was probably unsurpassed in picturesque beauty and botanical interest anywhere in the Temperate Zone. But over a great area of both Islands this noble forest is but a memory, and has vanished before the axe of the "timber-getter," and even more through the indiscriminate use of fire for clearing the country for agricultural and grazing purposes. In many districts all that remains to tell of its former glories is an occasional decaying log or tree-fern stump on a bare hillside, or a hideous array of miles of charred trunks of once majestic trees, rising from a tangled growth of furze, sweetbriar, and blackberry bramble, more impenetrable than the original "bush" and much more difficult to deal with. In the immediate vicinity of some of the principal towns,

notably at Nelson and Christchurch in the South Island, one may walk for a long distance without seeing a single indigenous plant, so completely has the native flora been ousted by introduced trees, shrubs, and weeds, mostly from our own country. No fewer than 350 species of these intruders were a few years ago enumerated by Mr. T. F. Cheeseman as having become more or less established in the neighbourhood of Auckland,* and many of these weeds grow with a vigour and luxuriance quite unknown in their native land. The disastrous effect on all forms of life of this destruction and replacement of the original vegetation need hardly be enlarged upon, and as it continues at an even accelerated pace, the necessity is only too obvious for immediate and thorough research in what still remains of the endemic animal life of New Zealand, before many of its most interesting forms are lost for ever. Fortunately there is in the Dominion at the present time a small but exceedingly capable body of Entomologists who are fully alive to the urgency of the matter, and the number of new and interesting forms in all Orders of insects brought to light by them in recent years bears ample testimony to their successful exertions. Even near the larger towns, notably at Dunedin, where a wide belt of "bush" surrounding the city has been specially reserved, some patches of the original woodland have escaped the general destruction, and still give shelter to many interesting insects and other forms of indigenous life.

The New Zealand forest is mostly evergreen in character, and thus varies but little in aspect at different seasons of the year. In many parts, especially at low elevations, it is largely composed of four or five noble species of Coniferous trees, chief of which is the famous "Kauri," one of the most magnificent timber trees in the world, but now rapidly approaching practical extinction, and found only in the northern half of the North Island. In the less settled parts of the Dominion, and in particular on the flanks of the mountain ranges, large stretches of forest still remain practically in their primeval condition, the subalpine scrub being of an exceedingly dense and impenetrable character, but containing

* Transactions, N.Z. Institute, XV, pp. 268–298.

many fine and curious flowering shrubs, some of which are now well known in cultivation. Towards the west the prevailing trees are several species of *Nothofagus*, a very interesting group of small-leaved, mostly evergreen beeches, miscalled "birch" in New Zealand, and "myrtle" in Tasmania. Trees of this genus are also predominant in the forests of Western Tasmania and Western Patagonia, to which they impart a characteristic aspect in common with those of New Zealand; and their present-day distribution strongly suggests the common origin of these widely-dispersed trees in a long-vanished sub-Antarctic land.

Comparatively few of the trees and shrubs in the lowland forests have conspicuous flowers, with the exception of the genus *Veronica*, which here includes trees of considerable dimensions, and the Myrtaceous genus *Metrosideros*, in which are some fine timber-trees as large as English oaks, whose many-stamened crimson and pink blossoms are in their season a most beautiful and conspicuous feature of the "bush." Where not actually under cultivation, the open ground unoccupied by forest is, in the North Island, covered in great part with a dense growth of "manuka" or "tea-tree" (*Leptospermum*), a Myrtaceous shrub or small tree whose profuse and fragrant white blossoms rival those of the hawthorn in their attractiveness to insects; or with a robust variety of our bracken (*Pteris aquilina* var. *esculenta*), the rhizome of which in old times formed an important item in the food-supply of the Maoris. In the South Island are wide expanses of level or slightly undulating land, sometimes many miles in extent, and covered with tall grass growing in definite "tussocks," other vegetation being usually little in evidence. This "tussock-land," which forms the finest of pasture, extends in places far up the mountain-sides, where, above the "timber-line," an Alpine flora exceedingly rich in species, and including many of the most remarkable and beautiful plant-forms of New Zealand, is found up to the limits of perpetual snow.

The diversified surface, the favourable climatic conditions, and the luxuriant vegetation of these beautiful Islands, at once suggest the existence of a profusion of species and

individuals in all Orders of insects; and in the light of our present knowledge, it is a little difficult to realise the opinion which prevailed up to quite a recent date, that New Zealand possessed probably the poorest and most limited insect fauna of any land of the same extent. Even as late as 1876, we find so eminent an authority as Mr. A. R. Wallace writing of its "excessive and most unintelligible poverty in insects," * and further on in the same great work,† he is disposed to attribute this poverty to the deficiency of the flora in gaily-coloured and conspicuous flowers—a deficiency by no means as great as was then generally supposed. And an excellent Entomologist, the late Prof. F. W. Hutton, writes as follows in 1873—"No New Zealand naturalist who has collected insects on however small a scale in Europe can I think fail to be struck with the paucity in New Zealand, not only of species, but in some Orders of individuals also. . . . On entering the bush, instead of finding the masses of decaying wood and leaves swarming with life, we hardly find a living creature, while at the same time we are attacked by myriads of blood-thirsty mosquitos (*Culex acer*). It would certainly seem that abundance of food does not produce abundance of individuals in some Orders (e. g. *Coleoptera*), neither does an absolute dearth of food in the imago state prevent the increase of individuals in others (e. g. *Diptera*)." ‡ Another good observer, Mr. C. M. Wakefield, states also at about the same time—"3000 species of Coleoptera have been found in Great Britain, and although I cannot say how many New Zealand species have been described, yet I do not think the number can possibly exceed 500. When, therefore, we consider what a diversity of climate and surface these islands present, it is obvious that there is ample scope for further investigation. Not only are our species few in number, but the individuals composing them are small and inconspicuous, and singularly destitute of brilliant colouring. The same dull and sombre hue so characteristic of the vegetation of New Zealand extends itself, with but few exceptions, to its fauna." §

The reason for this striking under-estimate of the richness

* Geog. Distribution of Animals, I. p. 450.
† Id., pp. 460–63.
‡ Trans. N.Z. Inst., V, p. 246.
§ Id., V, p. 297.

of the New Zealand insect fauna is not far to seek, for it is undoubtedly due to the fact that its great interest and importance were until quite recently not realised by entomologists in general, previous to which a certain lack of superficial attractiveness in the insects as a whole had led to their being somewhat neglected by collectors, professional and otherwise. The close research and observation carried out during the past thirty years by the resident entomologists of New Zealand, with the aid of such capable visitors from England as Mr. E. Meyrick and others, have completely dissipated the idea of an insect fauna unduly poor in number of species. But these researches have emphasised the isolated and distinctive character of the fauna, by revealing the striking inequality in the representation of the different Orders of insects, and the entire absence in all, of a great number of groups otherwise of almost universal distribution. Indeed, it may be said that the interest of the New Zealand insect fauna as a whole consists almost as much in its deficiencies, as in what it includes.

Comparatively few of the New Zealand insects are of diurnal or obtrusive habits, and their general apparent scarcity in species at any rate, is very evident to the ordinary collector, as indeed it was at first to myself. A very large number of insects in all Orders, especially in the Coleoptera, are most efficiently protected from casual observation by their inactive and retired habits, and even more by the eminently cryptic nature of their form and colouring, which harmonise in a greater degree with their special surroundings than is probably the case with the members of any other fauna. Very many species are exceedingly local, and confined to a very small area, and a large number of the finer forms now known have been recently obtained from mountain localities more or less difficult of access. When, however, the entomologist from England has realised the peculiar conditions under which most of the endemic insects live, he will find collecting fully as pleasant and remunerative as at home, though it may call for a greater amount of acumen and perseverance.

In the neighbourhood of the larger towns, the insects introduced accidentally or of set purpose from our own coun-

try, such as the hive-bee, the humble-bees of three or four species which were imported with much difficulty some fifty years ago, and which now abound everywhere, the blow-fly *Calliphora erythrocephala* Meig., and the drone-fly *Eristalis tenax* L., intrude themselves on the notice of the entomologist much more than is the case with the endemic insects of the Islands. They are, in fact, fully as much in evidence as the swarms of sparrows, greenfinches, linnets and starlings which have everywhere replaced the far more interesting small native birds, except in the recesses of the "bush" remote from cultivation.

The history of the progress of our knowledge of the Coleopterous fauna of New Zealand is very interesting. The first small collection brought to England, which, however, included several of the largest and most conspicuous species, was made during the memorable first visit of Capt. Cook to the islands in 1769–70; and many of these insects, which were described by Fabricius, still exist in the Banksian Collection in the Natural History Museum at South Kensington. Little or nothing was added to our knowledge until 1841, when some beetles were collected at Akaroa, Port Chalmers, and the Auckland Islands by the French expedition to the South under Capt. Dumont d'Urville; and a few were also obtained at the Bay of Islands in the North Island by the naturalists of our own Antarctic ships commanded by Capt. Sir James C. Ross. These latter insects, with a few more from other entomologists, among them Charles Darwin in the "Beagle," were described by Adam White in 1846 in the "Zoology of the Voyage of H.M. Ships Erebus and Terror," about 150 species of Coleoptera being then known from New Zealand. A small collection from the Christchurch district, sent home in 1867 by Mr. R. W. Fereday, was described in the "Entomologist's Monthly Magazine" of that year by Mr. H. W. Bates; and from this date the serious investigation of the New Zealand Coleoptera may be said to have commenced. Several valuable papers by the late Prof. Hutton, Capt. T. Broun, Mr. C. M. Wakefield, and other entomologists resident in New Zealand, as well as by Mr. F. P. Pascoe and Dr. D. Sharp, appeared between 1873 and 1884, mostly in the Trans-

actions of the New Zealand Institute; and in 1885 the last-named eminent Coleopterist, in the Transactions of the Royal Dublin Society,* made what was up to that time by far the most important contribution to our knowledge of the New Zealand beetle-fauna, mainly based on a very large collection from the South Island received from Mr. R. Helms of Greymouth. In this fine paper, to which I am greatly indebted, Dr. Sharp estimates "that New Zealand will be found to possess somewhere between 3000 and 3500 species of Coleoptera," a prediction which has been more than fulfilled. Prior to that date, however, Captain (afterwards Major) T. Broun, whose decease we have quite recently had to deplore, had issued at Wellington in 1880 the first part of his "Manual of New Zealand Coleoptera," in which 1141 species were enumerated. This work, although in parts decidedly open to criticism, has been of very great value to every one interested in the entomology of New Zealand; and to the end of his long life the author continued, almost single-handed and under many difficulties, to describe the multitude of hitherto unknown forms brought to light by his own researches and those of the other Coleopterists resident in the Dominion. The endemic members of several important families, such as the *Byrrhidae*, the *Cossonides*, and especially the *Pselaphidae*, have been revised by him in quite recent years. Just before his lamented decease, Prof. F. W. Hutton in 1904 published his exceedingly useful "Index Faunae Novae Zealandiae," which includes a complete catalogue of the insects as known up to that date, and enumerates 2735 species of Coleoptera as occurring in the Islands. At the present time about 4000 species, a number considerably in excess of that of our British beetles, are known to inhabit the New Zealand Region, and these are comprised in nearly 700 genera.

The unequal representation of the New Zealand insects is in no Order so strikingly evident as in the Coleoptera. Thus the important families *Cetoniadae* and *Cassididae* are entirely absent from the fauna; and only four small species of the *Buprestidae*, so abundant in species and individuals in Australia, have as yet been found in New Zealand. The

* New Series, Vol. III, pp. 351–452, plates XII, XIII.

great group of true dung-beetles, as might indeed have been expected in the case of a region which in all probability has never supported any terrestrial Mammalia except two small species of bats, are here represented only by a very few small forms of *Saphobius* (*Copridae*) and *Ataenius* (*Aphodiidae*), which are found under bark and in vegetable refuse. The very curious little blind Aphodiid *Phycochus graniceps* Broun, which lives in the sand under half-buried logs at high-water mark on the coasts, has, singularly enough, been found under similar conditions in Tasmania, in company with another member of the genus. The *Dytiscidae* number only sixteen species, and only one of these, the rare *Homoeodytes* (*Cybister*) *hookeri* White is of large size; our familiar *Rhantus pulverosus* Steph., whose range extends from our own islands to Tongatabu in mid-Pacific, being of very common occurrence. The *Chrysomelidae* again are few in species, except perhaps in the Galerucine genus *Luperus*, and they do not present a single form of large size or striking appearance. On the other hand the *Cicindelidae*, *Hydrophilidae*, *Staphylinidae*, *Lucanidae*, *Elateridae* and *Dascillidae*, as well as the *Heteromera*, are relatively much better represented, and the Longicornes can boast of some 220 species, a large number for a temperate region, though only two of these, *Prionoplus reticularis* F. and *Ochrocydus huttoni* Pasc., both among the most conspicuous of New Zealand insects, represent the large section of the *Prioninae*. The *Carabidae*, of which, however, the first sub-family (Carabides) has for its sole exponent the very anomalous *Amarotypus edwardsi* Bates, forms one of the largest and most important elements of the Coleopterous fauna, being only exceeded in this respect by the *Curculionidae*, of which family more than a thousand species are now known from the New Zealand region. The sub-family *Cossoninae*, which is characteristic of insular insect faunae in an eminent degree, is here developed to an extent proportionately exceeded elsewhere only in the Hawaiian Islands and in St. Helena. A single tree, the Nikau (*Rhopalostylis sapida* Sol.), the sole endemic palm, supports an interesting series of some eight or ten species included in four genera, and other remarkable forms of the sub-family are restricted to the tree-ferns

(*Cyathea*) and to the so-called "native flax" (*Phormium tenax* Forst.). A single species of the curious genus *Rhynchogonus*, whose head-quarters are in the Hawaiian Islands, has been found in New Zealand, and another has recently been met with in the Kermadec Islands to the northward. The *Cryptorrhynchina* are also very fully represented, especially *Acalles* and the allied genera, which include some very fine endemic forms. There are five species of the small but remarkable family *Rhysodidae*, a large number for a single limited region, and one of the very few members of the very aberrant family *Aglycyderidae* (*A. wollastoni* Sharp) is found rarely on the tree-ferns, the only other two species occurring in such remote localities as New Caledonia and the Canary Islands. The *Anthribidae* also include a considerable number of interesting insects, nearly all, however, being of small size; and in the *Colydiidae* and the *Pselaphidae* especially, the industrious researches of the present school of New Zealand Coleopterists, notably among them the late Major Broun, have revealed a wealth of species probably unequalled anywhere else in the world in singularity of form and diversity of structure.

COMPARATIVE TABLE OF REPRESENTATION IN CERTAIN GROUPS OF COLEOPTERA

Family or Section.	New Zealand (4000 species).		British Islands (3420 species).		Hawaiian Islands (1107 species).		St. Helena (129 species).	
	Genera.	Species.	Genera.	Species.	Genera.	Species.	Genera.	Species.
Cicindelidae	1	19	1	5	—	—	—	—
Carabidae	55	483	70	316	36	204	1	14
Dytiscidae	7	16	18	107	—	—	—	—
Pselaphidae	23	318	13	36	—	—	—	—
Colydiidae	27	171	15	19	1	1	—	—
Lucanidae	4	35	3	3	1	7	—	—
Cerambycidae	51	224	32	55	5	52	—	—
Phytophaga	17	139	52	247	—	—	1	3
Curculionidae	193	1049	96	476	12	132	15	65
(Apionides)	1	1	1	80	—	—	—	—
(Cossonides)	51	160	7	9	13	89	13	54
Anthribidae	9	73	5	8	—	—	3	26

In this connection it may be interesting to compare the representation of some of the principal families and sub-

families of Coleoptera in New Zealand with that of the truly endemic members of the same groups in two equally precinctive and peculiar insular faunae which have been about equally investigated, and with the same groups as found in the British Islands.

The great majority of the New Zealand beetles are of moderate or quite small dimensions, and are characterised rather by endless diversity of form and sculpture than by bright or conspicuous colouring. The largest beetle of the Islands, *Prionoplus reticularis* F., slightly exceeds our *Prionus coriarius* in size, and the single representative of the *Brenthidae*, *Teramocerus* (*Lasiorrhynchus*) *barbicornis* F., of which the male is often more than three inches in total length, is one of the finest and largest of the family, as well as one of the most remarkable and conspicuous insects in the fauna of the Islands. But there are, after all, a good many exceptions to the general dullness. The large metallic-green and coppery species of *Trichosternus* and *Zaeopoecilus* rival many of the European *Carabi* in size and brilliancy of colour, and another fine and very characteristic genus of the same family is *Mecodema*, of which nearly sixty species are now known from New Zealand, only two or three others occurring in Australia and Tasmania. These are black or dark bronzy beetles of varied and often elegant sculpture, the finest, *M. costellum* Broun, coming from Stephens Island in Cook's Strait, where also the largest species of the endemic Tenebrionid genus *Cilibe* is found. In the rich green flower-frequenting species of *Rygmodus* we find a brightness of colouring quite unusual in the *Hydrophilidae*, and the little "chafers" of the genus *Pyronota*, some of which are most abundant in summer on *Leptospermum* and other blossoms, yield to very few of their tribe in beauty of metallic colour. Their larger relative, the exceedingly rare *Poecilodiscus pulcher* Broun of the mountains of the South Island, is even more brilliant, and the largest Buprestid, *Nascio enysii* Broun, is also a charming little beetle. Among the *Elateridae* are some quite fine insects, one of the most singular being the large flattened *Psorochroa granulata* Broun, which is found rarely in crevices of rocks near the sea in some of the small off-lying islands; and the

Cleridae also include some very pretty little insects. Few Longicorns for their size exceed in elegance of form or beauty of subdued colour such species as *Hexatrichia pulverulenta* F., *Coptomma variegatum* F. (both of which, like *Teramocerus barbicornis*, have in recent years become very much less common than formerly), the apple-green *Calliprason sinclairi* White, and especially the little flower-frequenting members of the genus *Zorion*; while the large and rare *Blosyropus spinosus* Redt. of the South Island is one of the most quaint-looking beetles even in New Zealand. It is in the *Rhynchophora*, however, that we find the most singular and diversified forms of the endemic Coleoptera. The members of the small sub-family *Scolopterinae* (*Nyxetes*, *Ancistropterus*, *Scolopterus*, etc.) present a little assemblage of knobbed and spinose weevils of most distinctive appearance, quite unlike any forms from elsewhere, and the species of *Stephanorrhynchus*, *Hoplocneme*, and *Rhadinosomus*, to name only a few, are hardly less bizarre in aspect. Metallic or bright colours are rare in this family here, but a large number of species are of neat and attractive appearance, and the members of the genera *Rhynchodes*, *Agathinus*, *Lyperobius*, *Phaedrophilus*, and some other forms recently discovered in the mountains of the South Island at considerable elevations, are decidedly handsome insects.

Comparatively few of the beetles are individually numerous, the *Cicindelidae* forming one exception; *Cicindela tuberculata* F. in the North Island, and *C. latecincta* White in the South, are to be seen everywhere on roadsides and dry banks in summer, and are familiar to the youth of the Dominion under the curious name of "New Zealand bees." Only a few species may be regarded as in any way injurious to agriculture or otherwise, but the brilliant little "chafer" *Pyronota festiva* F. has been known to work considerable havoc with the blossoms of fruit-trees, and cereal crops and pastures are sometimes greatly damaged by the larvae of one or two species of the Melolonthid genus *Odontria*. The huge white larvae of *Prionoplus reticularis*, called "huhu" by the Maoris, and greatly esteemed by them as an article of food, live in the timber of the Kauri and other Conifers, but the trees are probably

attacked by the beetle only when they are in a state of incipient decay. Another of the larger Longicorns, *Aemona hirta* F., is sometimes destructive to orange and lemon trees in the North Island, as well as to the Puriri, or New Zealand teak (*Vitex littoralis*). This valuable timber tree is also subject to the attacks of the larva of the large Hepialid moth *Charagia virescens* Doubl., and sound logs are in consequence often difficult to obtain. Two weevils, *Mitrastethus bituberculatus* F. and the Cossonid *Xenocnema spinipes* Woll., are also at times somewhat injurious to Kauri and other Coniferous timber, and at Reefton, a mining town in the South Island hastily built of "Kahikatea" or so-called "white pine," I found that two or three of the native species of Cossonides, associated with incredible numbers of our familiar *Anobium domesticum*, had practically eaten up many of the houses, through the planking of which it was quite easy to thrust one's finger in places.

Like the Coleoptera, the Lepidoptera of New Zealand were for a long period regarded as being exceedingly poor in species, and generally of somewhat unattractive appearance. It cannot be denied that the butterflies and moths of the Islands include few forms of large size or bright colours, and that, as with the beetles, many groups of otherwise world-wide distribution are here strikingly deficient or entirely absent. But during the last half-century the number of known endemic Lepidoptera has been very greatly augmented by the researches of such diligent resident entomologists as Mr. C. M. Wakefield, Mr. R. W. Fereday, Prof. Hutton and Mr. G. V. Hudson, whose finely illustrated and most useful work "New Zealand Moths and Butterflies," published in 1898, marks an era in the study of the fauna of the Dominion. Even a greater debt is owing to Mr. E. Meyrick, who resided and collected actively in New Zealand for some years. Besides publishing the descriptions of a multitude of hitherto unknown species, chiefly in the "Transactions of the New Zealand Institute," he has in the same journal, between the years 1910 and 1917, revised and brought up to date our knowledge of nearly all the principal sections of the Order, as represented in the region. The extreme importance and interest of the

New Zealand Lepidoptera from an evolutionary standpoint, as well as of their geographical relations with the insect faunae of other regions in the Southern Hemisphere, are clearly shown in this series of masterly papers, my indebtedness to which in this Address I here gratefully acknowledge.

The number of species of Lepidoptera at present known from the New Zealand region reaches the respectable total of 1078, and their distribution among the principal sections of the Order is shown in the following Table.

TABLE OF NEW ZEALAND LEPIDOPTERA

Division or Family.	No. of		Endemic.	
	Genera.	Species.	Genera.	Species
Rhopalocera	9	15	4	10
Sphingina	2	2	—	—
Arctiidae and Hypsidae	3	5	1	4
Noctuina	26	109	8	93
Geometrina	28	219	9	210
Pyralidina	33	216	12	204
Tortricina	19	115	7	109
Tineina	95	364	37	344
Psychidae	2	2	1	2
Hepialidae	2	18	1	18
Micropterygidae	3	13	2	13
Total	222	1078	82	1007

Even in comparison with the general paucity of butterflies in the extra-tropical regions of the Southern Hemisphere, the number of species found in New Zealand is exceptionally small for its area. Only fourteen species (or fifteen if we include the intrusive and perhaps not fully naturalised *Danaida plexippus* L.) may be regarded as permanent residents; and these belong to only four main divisions, the almost universally distributed *Papilioninae*, *Pierinae*, *Erycinae*, and *Hesperinae* being totally unrepresented. Three of the five Vanessids, *Precis villida* F., *Pyrameis itea* F., and the almost ubiquitous *Pyrameis cardui* L. (var. *kershawii* McCoy), are well-known Australian forms, and the irregularity of their occurrence in different years suggests the probability that in

New Zealand their numbers are at times reinforced by migration from that continent across the Tasman Sea, with the aid of the prevailing strong westerly winds of those latitudes. One of the *Lycaenidae, Zizera labradus* Godt. (*Lycaena phoebe* Murray), is widely distributed throughout Australia and the Pacific Islands. The remaining ten species form a little endemic group of exceptional interest. The most showy butterfly is the beautiful *Pyrameis gonerilla* F., which represents our "Red Admiral" in the Dominion, and greatly resembles it in appearance and familiar habits; its larva, too, feeds in a closely similar manner on the big shrubby nettle *Urtica ferox*, in little tents made of leaves spun together. It is generally common throughout New Zealand, from the North Cape to Stewart Island, and is represented in the Chatham Islands by the closely allied *P. ada* Alfken. Three pretty species of *Chrysophanus* are also widely distributed; *C. salustius* F. is the commonest of these, the more handsome *C. feredayi* Bates being somewhat more local, and the larvae of both species may be found feeding on the imported sorrel in the same way as that of our *C. phlaeas*. The little purple-flushed *C. boldenarum* White occurs, sometimes abundantly, in dry stony places and shingly river-beds, and the inconspicuous *Lycaena oxleyi* Feld. is usually met with in similar situations.

By far the most interesting butterflies in New Zealand are the four endemic species of *Satyridae*, each one being the sole representative of its genus. *Dodonidia helmsi* Fereday, a somewhat rare and very richly coloured insect, flies in February in sunny openings in the forests on both sides of Cook's Strait, usually at a considerable height above the ground, and its capture is thus by no means easy; the food-plant of its larva is the large sedge or "cutting-grass," *Gahnia setifolia*. The other three species are, so far as is known, entirely confined to the South Island. *Argyrophenga antipodum* Dbld. is the characteristic butterfly of the "tussock-lands," its range extending from near sea-level to upwards of 4000 feet, and where it occurs it is often very abundant. The underside of the wings of this butterfly, with its longitudinal silvery stripes on a ground-colour of soft ochreous-

brown, is very conspicuous in the cabinet; but when it is at rest at the bottom of a "tussock," these markings harmonise most perfectly with the lights and shadows of the yellowish grass-stems, and in this environment the insect presents as complete and beautiful an example of protective resemblance as our own "Orange-tip" on its favourite white Umbelliferous flowers. *Percnodaimon* (*Erebia*) *pluto* Fereday is in appearance and structure, as well as in habits, wonderfully like some of the black Erebias of the European Alps, and is fairly widely distributed and sometimes common on shingly mountain slopes at elevations between 4000 and 6000 feet. As I have unfortunately no practical experience of this mountain butterfly, I cannot refrain from quoting the very interesting remarks of Mr. H. Hamilton on the habits of the insect as observed by him in its native surroundings.* "*Erebia pluto* can only be located when the sun is shining strongly and continuously. This beautiful black butterfly is then to be seen hovering over the shingle-slips, and apparently following well-defined air-tracks. It was noticed that the best way to capture them was to sit close to a place they had been seen to pass, and keep perfectly still. Presently one would come sailing along, and apparently not notice the collector. A very quick movement with the net was necessary to catch the insect, and if you missed the first stroke the chances were all on the butterfly escaping. On being disturbed they make rapid jerky upward movements, and soon get out of the danger-zone, flying away to some other slope. As soon as the sun is obscured by a cloud all the butterflies alight and remain motionless until the sun shines again. As sunshine is the exception rather than the rule on these mountain-tops, *Erebia*-hunting is very trying to the patience."

Erebiola butleri Fereday is also restricted to similar high altitudes, but is a much more local and less common insect than *P. pluto*. To quote Mr. H. Hamilton again: † "As a rule, the habits of the *E. butleri* are sluggish, and it does not make long flights; it frequents some particular tussock-clump and flutters about there. The position of the female is generally indicated by watching the movements of the males,

* Trans. N.Z. Inst., XLIII, p. 117. † L.c., p. 122.

and noticing where they hover for a longer time than usual. During the bright sunshine the male *butleri* is seldom ever seen at rest, and appears to fly backwards and forwards along well-defined routes within certain natural boundaries. This ' trade-route ' habit is specially characteristic of *E. pluto* also."

In addition to the endemic butterflies of New Zealand, several wanderers from other regions have occasionally been found within its limits. Writing as long ago as 1855, the Rev. Richard Taylor, in his very interesting work " Te Ika a Maui," mentions " a fine large butterfly, closely resembling the English Purple Emperor," as being found in the Middle (South) Island; and in the second edition of the book, published in 1870, is a tolerable coloured figure of the male of *Hypolimnas bolina* L. under the Cramerian name of *Diadema auge*. This butterfly has been taken not unfrequently in recent years, and the large size and fine colouring of the specimens, notably of the female figured by Mr. Hudson in " New Zealand Moths and Butterflies," would appear to point to North Australia as their place of origin. *Limnas chrysippus* L., *Catopsilia catilla* Cram., and an unidentified species of *Euploea* are exceedingly rare visitors, also in all probability from Australia. More difficult of explanation is the undoubted occurrence, at Wellington in 1881,* and at Orepuki, at the south extremity of the South Island in 1903,† of several specimens of our *Pyrameis atalanta*, whose nearest station, to which it has found its way from North America, is in the Hawaiian Islands, at least 4000 miles distant from New Zealand. Even more inexplicable is the reported capture of *Aglais urticae* at Wellington, at the same time as that of *P. atalanta*, by Mr. T. Kirk; and I understand that even our *Pieris rapae* has on one occasion been observed at this port, having almost certainly been brought thither by chance in one of its early stages.

The powerful flight and wandering propensities of the *Sphingidae* have carried certain species of the family to some of the most remote oceanic islands, but only two have been observed in New Zealand. These are *Herse convolvuli* L.,

* Trans. N.Z. Inst., XVI, p. 550. † Id., XXXVI, p. 161.

which, although by no means generally common, appears to be fully established in the Islands; and a few examples of the almost equally widely-ranging *Hippotion celerio* L. have been met with in recent years. The great assemblage of moths included under the obsolete but in some respects convenient name of the *Bombycina* are all but unrepresented in the fauna, several important families, as the *Limacodidae*, the *Lasiocampidae*, and the *Saturnidae*, being entirely absent; the sole representative of the *Hypsidae* is *Deilemera annulata* Boisd., whose sharply contrasted black and white markings and diurnal flight render it one of the most conspicuous and familiar of the insects of New Zealand. The very few *Arctiidae* include the widely distributed *Utetheisa pulchella* L. which is a fairly frequent visitor and perhaps established in the North Island, and three species of *Metacrias*, an endemic genus probably most nearly related to the South European genus *Ocnogyna*. The males of these are handsome and very active little "tiger-moths," which fly in the sunshine at rather high elevations in the South Island, the females being practically apterous, and covered with a thick coat of yellowish hair-scales.

We have yet another instance of unequal representation in the case of the Noctuid moths. In his "Revision of the New Zealand *Caradrinina*,"* Mr. Meyrick enumerates 97 species, and the researches of the resident Lepidopterists, not forgetting those of our Fellow Dr. G. B. Longstaff,† have added about a dozen more in recent years. Seven of the genera, and a very large percentage of the species, are entirely restricted to the New Zealand region, and the great majority of these are comprised in a single sub-family, the *Melanchrinae*, the genus *Melanchra* alone having no fewer than 37 species. The multitude of diversified forms until recently included under the comprehensive title of the *Quadrifinae* are here represented only by a very few stragglers, chiefly from Australia and the Pacific Islands; and within the limits of the region we also find *Heliothis armigera* Hubn., *Leucania* (*Aletia*) *unipuncta* Haw., *L. loreyi* Dup. (in the Kermadec

* Trans. N.Z. Inst., XLIV, pp. 86–107.

† "Butterfly-hunting in Many Lands," pp. 449, 451, 474.

Islands), *Agrotis ypsilon* Rott., and even our little *Hypenodes costaestrigalis* Steph., all insects of nearly world-wide distribution. A good many of the endemic Noctuae are handsomely marked and attractive-looking moths, though few are of bright colour or more than moderate size; and they share with our species their susceptibility to the attractions of "sugar," which is resorted to by the resident Lepidopterists with as much success as at home.

The Geometrina form an outstanding feature in the Lepidopterous fauna of New Zealand. In number of species they are surpassed only by the Tineina, and in beauty of varied pattern and delicacy of colouring many are excelled nowhere else in the world. In the words of Mr. Meyrick,* "the group exhibits the same inequality of representation of families that has been noticed in the others; three-fourths of the whole number of species belong to the family *Hydriomenidae*, which is very adequately represented, while the *Selidosemidae* and *Monocteniadae* are very imperfectly exhibited, and the other families either wholly absent or indicated only by one or two casually introduced immigrants." The foreign element is here even less in evidence than in any other division of the Lepidoptera, and only some nine or ten of the 219 known species are found beyond the limits of the New Zealand region. A few species occur in open situations, but the greater number inhabit the forest, and in many cases their colour and markings exhibit a beautifully protective adaptation to their environment. The members of the genera *Notoreas*, *Dasyuris*, and *Arcteuthes*, are brightly coloured mountain insects which fly in the sunshine up to an elevation of 6000 feet, and are found mostly in the South Island, and the species of *Declana*, which include some of the most handsome of the indigenous moths, are distinguished by their robust build, strongly contrasted patterns, and in the commonest, *D. floccosa* Walk., for extreme variability in colour and markings.

The Pyralidina of New Zealand number 216 species, included in 33 genera, and as pointed out by Mr. Meyrick,† comprise

* Revision of the New Zealand *Notodontina*, Trans. N.Z. Inst., XLIX, pp. 248–273.

† Revision of the New Zealand *Pyralidina*, Trans. N.Z. Inst., XLV, p. 50.

22 per cent. of the entire Lepidopterous fauna, a higher proportion than in any other region. This is mainly due to the enormous development of the *Crambidae*, *Crambus* alone containing 42 species; and especially to that of the genus *Scoparia*, of which no fewer than 92 endemic species are now known. It is only in the Hawaiian Islands, from whence about 60 species have been recorded, that we find this well-marked genus so largely in evidence. Many of the principal families are either absent, or barely represented by a very few stragglers or immigrants, but there are 16 endemic species of the *Pterophoridae*, and the widely distributed *Stenoptilia zophodactyla* Dup. has been found at Wellington. *Pyralis farinalis* L., *Plodia interpunctella* Hübn., and *Meliphora grisella* F. have also been introduced by commerce, and are now established in the Dominion. The Tortricina present a considerable variety of forms, nearly all endemic, but only one of these, *Cacoecia excessana* Walk. appears to be of economic importance, its larva sometimes attacking apricot and other fruit trees. The "Codlin Moth," *Carpocapsa pomonella* L., has been introduced into New Zealand, but fortunately has not there become so great a pest as in Australia and Tasmania.

In his "Revision of the New Zealand *Tineina*," * Mr. Meyrick remarks that "the *Tineina* usually constitute more than one-third of the Lepidoptera of any given region, and this proportion is apparently maintained in New Zealand." As 364 out of the 1078 species now known from the region belong to this division of the Lepidoptera, this estimate of its representation is very nearly exact. Fully one-third of these, again, are included in a single family, the *Oecophoridae*, and only in Australia does this family bear as large a proportion to the entire Tineid fauna. On the other hand, the extensive family *Gelechiadae* is represented by only a few species, and the *Adelidae*, which Mr. Meyrick says (*l.c.* p. 206) are "an ancient family and present in all the other continental regions (for I consider New Zealand as a continent, or rather the remains of one)" are entirely absent. Our "Currant Clearwing," *Trochilium tipuliforme* Cl. has been introduced, and is now to be found throughout the Dominion; and the cosmopolitan

* Trans. N.Z. Inst., XLVII. pp. 205–244.

Plutella cruciferarum Z. is here, as elsewhere, a serious pest to turnips and other crops of a similar kind.

The *Zygaenidae* are entirely absent, and there are only two species of the *Psychidae*. The large larva-cases of *Oeceticus omnivorus* Fereday are conspicuous on many indigenous and imported trees throughout the Islands, but are said to be less common than in former years. The *Hepialidae* include several fine species, among them the largest Lepidopterous insect of New Zealand, *Charagia virescens* Dbld. This very handsome green moth, whose life-history is fully and admirably detailed by Mr. Hudson in his "New Zealand Moths and Butterflies," is by no means rare, especially in the North Island, though the perfect insect is not often seen, and most of the specimens obtained are bred from the pupa. The larva feeds in the solid wood of living trees, and from its large size is capable of doing a great deal of damage. For a long time this larva was supposed to be the host of the fungus *Cordyceps robertsii*, well known as a curiosity under the name of the "New Zealand Vegetable Caterpillar"; but the ground-feeding larvae of the allied genus *Porina* have recently been ascertained to be the true hosts of this singular parasite. The *Micropterygidae* of New Zealand are of exceptional interest as including, in the genera *Mnemearcha* and *Sabatinca*, the most ancient and primitive forms of Lepidoptera now existing. A single species of the last-named genus is known from Queensland, but with this exception, the three genera and thirteen species occurring in the Islands are strictly endemic.

In his valuable paper "On the Geographical Relations of the New Zealand Fauna," Prof. Hutton in 1872 wrote as follows *—"The Heteroptera are remarkable for their fragmentary character, and wide distribution. The 13 known species belong to 13 different genera and 9 families; and there are not more than 7 endemic species, three of which have not been properly examined, and may therefore be found to be identical with species inhabiting other countries. . . . In strong contrast to this stand the Homoptera, which include 19 species, of three (*sic*) genera only; *Cicada* having 12, and *Cixius* 7 species." But while a fair number of species have since been

* Trans. N.Z. Inst., V, pp. 247–8.

added, the Heteropterous fauna of New Zealand remains one of the poorest and most scanty of all, and this was certainly my own impression when I was collecting there. As revised by the late Mr. G. W. Kirkaldy in 1909,* the fauna now includes 48 Heteroptera and 39 Auchenorrhynchous Homoptera, and of these some 40 species are endemic. Almost without exception, the forms in the first division are of small size and obscure colouring, but the second includes an interesting series of nearly twenty endemic species of *Melampsalta* (*Cicadidae*) which are a conspicuous feature in the insect life of New Zealand. As in the Hawaiian Islands, there are no endemic *Aphididae*, though some introduced species are now common; but the *Coccidae*, which have been worked out in an admirable series of papers in the Transactions of the New Zealand Institute by the late Mr. W. H. Maskell, number upwards of 90 endemic species, besides a score or more introduced from other parts of the world.

Another very poorly represented Order is the Hymenoptera. As enumerated by Prof. T. D. A. Cockerell,† the *Anthophila* include only 18 species comprised in three genera, *Prosopis*, *Halictus*, and *Paracolletes*, the last-named being common to Australia and New Zealand. Dr. A. D. Forel ‡ records 19 species of ants, nearly all of which are endemic; and while the Fossores are not much better represented, and the true wasps are entirely absent, a fair number of the *Parasitica* have been described from the region. With the exception of a single species of *Xiphydria*, the Phytophagous Hymenoptera appear to be entirely wanting; and at present not more than 200 species of the Order in all are known from New Zealand, but further researches are sure to add considerably to this number.

We owe most of our knowledge of the New Zealand Diptera to Prof. Hutton and Mr. P. Marshall; and the Order is, next to the Coleoptera and the Lepidoptera, the most fully represented in the region. It includes some fine and curious endemic forms, the large and very rare Anthomyid, *Exsul singularis* Hutton, from Milford Sound in the South Island, being one

* Trans. N.Z. Inst., XLI, pp. 22–39.
† Proc. Acad. Nat. Sci. Philadelphia, LXVIII, p. 68.
‡ Trans. N.Z. Inst., XXXVII, pp. 353–355.

of the most extraordinary flies known, its very broad and short wings giving it somewhat the aspect of a Stylopid on a large scale; and the larvae of the Mycetophilid *Bolitophila luminosa* Skuse, which live gregariously in a slimy web on damp banks in the "bush," well deserve the name of the "New Zealand Glow-worm." Although the Maoris assert that mosquitoes were unknown before the coming of the English, the endemic species are quite sufficiently blood-thirsty, though none of them appear to be bearers of malaria; and sand-flies (*Simulium*) are very troublesome in some places, especially in the rainy forests of the South Island.

The few Trichoptera call for little remark, except that the larva of *Philaniscus plebeius* McL. lives among seaweed on the coast between tide-marks, a habit almost or quite unique in the Order. In the genera *Stenosmylus* and *Drepanepteryx*, the Neuroptera-Planipennia includes several endemic forms of great beauty; and in the Odonata, of which ten species, comprised in five families and six genera, are restricted to the region, *Uropetala carovei* White, allied to the equally large Chilian *Phenes raptor*, is one of the finest dragon-flies in the world. Three peculiar species of *Termitidae* are found in New Zealand, but they do no appreciable damage. In the *Ephemeridae* are one or two exceedingly fine forms, of which the most noteworthy is *Oniscigaster wakefieldi* McL., with its extraordinary hind-body looking like that of some Crustacean. It is greatly to be regretted that this unique insect, as well as several others of its family, has been practically exterminated by the trout introduced in such numbers into the country during recent years.

Among the most conspicuous and remarkable of New Zealand insects are the apterous forest-crickets of the family *Stenopelmatidae*, known throughout the Islands by the Maori name of "Weta," and of which some thirty-five species have been recorded. The largest of these, the "Weta-punga," *Deinacrida heteracantha* White, whose body is nearly as bulky as that of a mouse, and whose stout spiny hind-legs are six inches in length, lives in holes in trees in the North Island. It is now extremely rare, having been, it is said, nearly exterminated by the introduced Norway rat, and commands a high

price as a curiosity. The much commoner *Hemideina megacephala* Buller, which is also reported from Lord Howe Island, is not greatly inferior in size, and the huge head and mandibles of the male give it an equally formidable appearance; and the cave-dwelling species of *Pachyrhamma* are noteworthy on account of the inordinate length of their slender antennae. The single Mantid, *Orthoderes ministralis* F., is found also in Australia and Tasmania, and is perhaps a recent introduction, and the *Phasmidae*, of which there are some twelve species, include one or two forms of considerable size. Three or four *Blattidae* at most are indigenous; *Platyzosteria novae-zealandiae* Walk., a highly odoriferous cockroach which abounds under loose bark, is familiar throughout the Dominion under the name of the "Maori Bug." The large and stout *Anisolabis littorea* White is the only common species of the very few endemic *Forficulidae*; our common earwig has gained a footing in a few places, but is by no means the pest that it has become in Tasmania. Finally, the only *Siphonaptera* which are found in New Zealand appear to be the best-known and universal species of the Order, and two others attached to domestic animals. Dr. Dieffenbach, writing in 1843,* states that "the natives say that fleas were introduced by Europeans, and for that reason sometimes call them 'te pakeha nohinohi,' the little stranger," but as early as 1773 the Maori huts at Queen Charlotte's Sound were found by Capt. Cook's sailors to be "exceeding full of vermin and particularly fleas," † and these insects are no doubt coeval with the first human inhabitants of the Islands.

The insect fauna of the outlying islands of the New Zealand region, though as yet imperfectly known, presents many features of great interest. A few insects were obtained in 1909 by Mr. W. L. Wallace from the volcanic but forest-clad Kermadec Islands, some 500 miles north-east of the North Cape. The thirty-eight species of Coleoptera show marked affinity with those of New Zealand, thirteen being described as new by Major Broun. More than half of the 46 species of

* Travels in New Zealand, II, Appendix, p. 291.

† G. Forster, Voyage round the World in H.M.S. "Resolution," I, p. 201.

Lepidoptera, among which are three butterflies, *Melanitis leda* L., *Hypolimnas bolina* L., and *Pyrameis itea* F. are common species of wide distribution; ten are New Zealand forms, and eight are described by Mr. Meyrick as new. The notorious plague-flea, *Pulex cheopis*, has found its way to these remote islands, which swarm with rats; as well as our *Coccinella 11-punctata*, now abundantly naturalised throughout New Zealand.

The larger group of the Chatham Islands is about 450 miles east-south-east of Cook's Strait. They possess a luxuriant vegetation, with a good deal of forest, and the number of resident species of insects at present known will certainly be largely augmented by further research. Besides the butterfly *Pyrameis ada* Alfken, already mentioned, 106 species of Coleoptera have so far been recorded; 49 of these are endemic, the remainder being well-known New Zealand forms. They include 12 Longicorns, three *Anthribidae*, and eight *Cossoninae*, and the rare *Acalles fougeri* Hutton, is the largest and finest known member of this extensive genus.

The widely scattered island groups in the stormy ocean south and east of New Zealand, and the solitary Macquarie Island far to the south-west, have in recent years been visited by several naturalists; and the results of the scientific expedition despatched thither under the auspices of the Dominion Government in 1907 are embodied in the two fine volumes entitled "The Subantarctic Islands of New Zealand," published two years later. In this enterprise Entomology was most adequately represented in the person of our Fellow Mr. G. V. Hudson, whose researches, however, were confined to the Snares and the Auckland Islands. Six species of Coleoptera, including a fine new *Mecodema*, were found in the former little group, distant some sixty miles south-west from Stewart Island. From the Auckland Islands, so renowned among botanists for their beautiful and most peculiar Flora, some half-dozen species of beetles were obtained by the French Antarctic expedition under Capt. Dumont d'Urville in 1840; and this number was increased to thirty by Mr. Hudson. Nine additional species were found by Mr. Marriner, another member of the expedition, at Campbell Island, which lies about 180

miles south-east of the Aucklands, and possesses a somewhat similar flora, except that true forest growth is absent. The 46 species of Coleoptera now known from the Subantarctic Islands, the predominant groups of which are the *Carabidae* and the *Rhynchophora*, are referred to no fewer than 26 genera, eight of these being endemic. No butterfly was observed in these islands, and only one Noctuid moth, *Melanchra erebia* Huds., a species of rather striking appearance; some half-dozen *Geometrae*, and the same number of species of the dominant genus *Scoparia*; a remarkable new Pyralid genus and species, *Protyparcha scaphodes* Meyr., with one or two Micro-Lepidoptera; in all about twenty species, twelve of which are endemic, though obviously allied to New Zealand forms. Except the *Diptera*, of which one or two very remarkable apterous and semi-apterous species were met with, the other Orders are very scantily or not at all represented.

In Antipodes Island, 490 miles east-south-east of the South Cape of New Zealand, Prof. Hutton observed the conspicuous Hypsid moth *Deilemera annulata* Boisd.; besides this insect, only three Diptera and a bird-flea, *Goniopsylla kerguelensis* Tasch. have been recorded from this lonely speck of land. The even more desolate rocks a little to the northward known as the Bounty Islands, though they are without a trace of terrestrial vegetation, have produced a single Hydrophilid beetle, *Thomosis guanicola* Broun, a remarkable Stenopelmatid cricket *Ischyroplectron isolatum* Hutton, and two or three flies, all living in deposits of seaweed and guano at high-water mark. Macquarie Island, in latitude 54° 30′ S. and longitude 158° 50′ E., has a fair amount of vegetation, but its only recorded insects are two peculiar species of Diptera. The biologists of the recent Australian Antarctic Expedition found "numerous beetles under stones and moss" in this island; these apparently have not yet been described, but cannot fail to be of exceptional interest, and in all probability will prove to be related to the singular forms occurring in Kerguelen Island.

Two islands in a far more genial climate, included in the New Zealand zoological province, remain to be considered. Norfolk Island lies about half-way between New Caledonia and New Zealand, and its fauna and flora, although mainly

Australian in general character, exhibit unmistakable affinities with the latter. These are most pronounced in the case of the endemic birds, but among the Coleoptera are two species of *Xylotoles*, one of the most characteristic of the New Zealand Longicorn genera. Some thirty species of beetles have been recorded, but a much greater number must inhabit an island of such luxuriance and fertility. In Lord Howe Island, which is only 300 miles from the Australian coast, and more than twice as far from the nearest point of New Zealand, about 80 species of Coleoptera, included in no fewer than 68 genera, have been found; among these are two species of *Xylotoles* and two of *Somatidia*, the latter genus being otherwise restricted to New Zealand. Unfortunately the representatives of the other Orders in these very interesting islands appear to be almost unknown, except the butterflies, all of which are of Australian species with the exception of the fine *Papilio amphiarans* Drury of Norfolk Island, which has its nearest ally in New Caledonia.

It will be evident from this general review that the outstanding feature of the insect fauna of New Zealand is its eminently precinctive and isolated character, which it exhibits in common with all the living productions of the region. The origin and affinities of these have been the subject for many years past of a large amount of speculation and discussion on the part of students of the geographical distribution of animal life; and the general constitution of the fauna may be stated in the words of Prof. F. W. Hutton, one of the most eminent of these *—"The fauna may be divided into a small aboriginal element, including species which have no near relatives elsewhere, and larger Malayan, Australian, and Antarctic elements, as well as several smaller ones. In many cases, however, it is hard to say in which group a species should be placed, for its relations are so widely scattered. Taking a broad view of the whole fauna, however, it may be said that the terrestrial portion is chiefly of Malayan origin, but with rather strong Palaearctic and Neotropical connections." The origin of the aboriginal element may date back as far as the beginning of the Tertiary period, and among the insects it probably includes

* Index Faunae Novae Zealandiae, Introduction, p. 5.

most of the *Colydiidae*, and such forms as *Brounia*, *Dendroblax*, *Camiaius* and others among the Coleoptera, *Oniscigaster* among the *Ephemeridae*, and the very primitive and archaic *Mnemearcha* and *Sabatinca* in the Micro-Lepidoptera, to mention only a few forms. Probably all these are relics of the fauna of a vanished continental land in the South Temperate Zone, of which the site is in part indicated by the relatively shallow soundings of the New Zealand Plateau. This may at some period of its existence have been connected with what is now South America, and by this "land-bridge" the Neotropical element, so plainly indicated in the Fauna and Flora of New Zealand, may have been transmitted. As pointed out by Mr. Meyrick, this affinity between the two faunae is very evident in the principal divisions of the Lepidoptera, and especially so in the *Geometrinae*; and I well remember how much I was impressed, when in New Zealand, with the strong general resemblance of many of the Geometrid moths to those I had made acquaintance with in Chile some twenty years previously. The nearest allies of the remarkable butterfly *Argyrophenga antipodum* are to be found among the Chilian *Satyridae*; and the very distinct Tipulid genus *Macromastix* is also represented in Chile as well as in Amboyna. This last, however, is evidently a form of very great antiquity and wide distribution in bygone ages, as Prof. Cockerell informs me that a species of this genus has been recently detected in a stratum of Oligocene age in the Isle of Wight.

In the three endemic species of *Chrysophanus*, and especially in *Percnodaimon pluto*, which is practically an *Erebia*, we find an unexpected and not easily explicable affinity with the Palaearctic fauna; and a slight relationship with that of the Ethiopian region is indicated in the Histerid genus *Sternaulax*, one of the two species of which is found in New Zealand, and the other in Madagascar. A much larger element appears to have been derived originally from what are now the Austro-Malayan and Melanesian regions by way of extensions northward of the former "Greater New Zealand" as indicated by shallower soundings in this direction. These "land-bridges," however, have long been severed by the subsidence of the greater part of this ancient land, which occurred before many

of the more recently developed forms of life were in existence. The great gaps in the fauna of New Zealand are thus explained, and so great an amount of generic and specific evolution has taken place within its restricted limits since its final isolation, that the affinities already indicated alone remain to tell of the former connections of the Islands with other regions. The surrounding ocean, too, has in recent times proved to be an effectual barrier to the interchange of species. Even in the case of the nearest continental land, though such insects as the strong-winged *Pyrameis itea* and *Precis villida* and a few Coleoptera, chiefly Longicorns and small dung-beetles, have made their way from Australia to New Zealand across the stormy Tasman Sea, probably less than a dozen species of New Zealand beetles have been found in Australia. The *Chrysomelidae*, *Cetoniadae* and *Buprestidae*, which are there so fine and so well represented (one Buprestid genus, *Stigmodera*, alone including no fewer than 420 Australian species), are in the Islands entirely absent or represented only by a few small or obscure forms; and of the numerous and characteristic group of Australian weevils, the *Amycterinae*, only a single species has been found as yet in New Zealand.

Instances of the unique and precinctive character of this wonderful insect fauna may be multiplied as regards all the Orders; but sufficient has been said, I trust, to illustrate its surpassing interest and importance in the scheme of the life-history of our globe, and to emphasise the immediate and urgent necessity of completing our knowledge of the insect life of New Zealand, before many of its most interesting and instructive forms disappear for ever before the march of settlement and cultivation.

It only remains, in concluding this Address, to express my sincere thanks for the uniform kindness and consideration which have been extended to me by each and every Fellow of the Society during the period of my occupation of the Presidential Chair, as well as by the members of the successive Councils during the sixteen consecutive years in which I have had the honour to hold responsible office; and to congratulate the Society on the choice of the distinguished Zoologist whom you have elected as my successor.

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